6 Spatial Analysis

6.1 Introduction

6.1.1 Problem and goal

This chapter focuses on the spatial aspects of habitation zone 1. We will consider the 12 loci separately, discuss recurring patterns and variability among them and, finally, attempt an evaluation of their possible interrelationship. Obviously, this chapter will rely heavily on insights gained in all of the previous chapters, as it explores the spatial output of the combined morphological, technological, functional, and refitting analyses. Since the range of potentially meaningful attributes is almost infinite, the present contribution should not be regarded as 'the' spatial analysis of Rekem. Our primary goal with this contribution is to show that significant results can be obtained with this approach of intra-site analysis, even for sites occurring in bioturbated sands and lacking in organic remains.

Indeed, although they are not always sufficiently taken into account, it is now fully accepted by most field workers that manifold non-anthropogenic processes can seriously affect the spatial position of prehistoric artefacts occurring in sands[1]. The generalised vertical dispersion of lithic materials in sand sites all over Western Europe reaches at least 30 cm, and often more, and simply cannot be explained by systemic human processes alone. Various non-anthropogenic causes have been invoked, studied, and tested both in experiments and in site reports.

Of primary archaeological importance in all these studies, is the question as to what degree this post-depositional disturbance affected the horizontal distribution of the artefacts. In other words, how close are the present-day excavation plans to the original horizontal living floor immediately after the occupation, or how closely can they possibly be restored to that situation?

Various models have recently been proposed which attempt to cope with these disturbing factors and to assess their impact on the artefact distributions. Some authors have been quite optimistic. Barton[2] has suggested that "*by quantifying the natural effects, it is possible to reset the clock to the time that a site was abandoned and to observe spatial clustering of artefacts before many of the post-depositional processes had the time to take effect*".

While this view is certainly attractive, more pessimistic researchers have expressed serious doubts. As Stern[3] has written, "*archaeological data are a transformed record of past human activities, and there is no way of 'correcting' for the effects of the transformation to which they have been subject (...) without a priori knowledge of the material consequence of the behaviours being reconstructed. This is a logical impossibility. Those who ignore it run the risk of assuming what they are trying to find out*". Warnings and scepticism have also been recently expressed for Belgian sites occurring in sands[4].

Although we agree with the general sentiments expressed by these warnings, we have always found it difficult to adhere a fatalistic attitude towards the spatial potentiality of sand sites. As archaeologists, we must try to explain the presently observed archaeological record as accurately as possible, including its spatial dimension. Some degree of circular reasoning in a logical sense can sometimes not be avoided and can actually be detected in much of the archaeological reasoning.

However, in the present state of research, we do not believe in an accurate 'restoration' of the original scatter. The natural processes potentially responsible for the ultimate spatial layout of artefacts in sands are quite numerous and (partially) acted simultaneously in a cumulative way. Therefore, in most cases, we are not convinced that they can be identified sufficiently accurately to allow for a recalculation of the original lay-out at a specific site. There are as yet no formulae to restore sites to their '*pristine glory*'[5].

Given this situation, we would propose to invert the above question regarding the effect of non-anthropogenic disturbances and instead to investigate whether and to what degree we can still recognise and identify small-scale anthropogenic processes in the spatial distribution of the archaeological record. Or, more specifically, can we detect intra-site spatial patterns for which natural phenomena can hardly be held responsible, but that are easily explained with anthropogenic processes in mind? The transport of

1 Wood & Johnson 1978; Schiffer 1987; Vermeersch & Bubel 1997; Vermeersch 1999; see chapter 1.
2 Barton 1992, 78.
3 Stern 1994, 170-171.
4 Crombé 1996; Vermeersch & Bubel 1997; Vermeersch 1999.
5 Gamble 1991.

artefacts from one unit to another over a considerable distance, as demonstrated by the refitting, would be a good example of a spatial observation that can best be explained by anthropogenic processes. Here, however, we mainly want to explore to what degree spatial configurations within limited areas (intra-locus) have conserved the original 'end-of-occupation' layout.

6.1.2 Methods and approach

Like natural phenomena, anthropogenic or cultural formation processes were also complex and cumulative. This is certainly so on locations where a succession of activities took place such as around hearths or inside dwellings (see chapter 1). To answer the question posed above, it seems therefore most appropriate to start with the small units that were seemingly only briefly occupied and where the observed activities were minimal. In a hunter-gatherer context, peripheral areas would fit best as these are usually less ubiquitous and retain more spatial integrity than core (hearth) areas where different tasks were performed[6] and that were more likely to have been exposed to successive maintenance activities with organised waste disposal[7]. In the present chapter, we will therefore start with Rekem 15, a site that could be diagnosed as a limited-activity ('knapping spot'), short-term occupied area, situated on the periphery of the settlement. Such a locus can be conveniently 'tested' by hypotheses relating to the spatial layout of the primary flint working refuse. Other primary knapping spots, such as Rekem 16 and Rekem 13, will also be examined in the initial sections.

Next, we shall proceed to increasingly complex loci with an ever-growing palimpsest character to work out whether significant patterns can still be recognised. Examples of these complex sites are loci with specialised tool-production areas (Rekem 7 and Rekem 11), dwellings (Rekem 10 and possibly Rekem 12), large communal work areas at outside hearths (Rekem 5 and Rekem 6) and, finally, a dump spot (Rekem 1). Clearly, all these interpretations, while based on the detailed analyses presented in the previous chapters, are still hypothetical at this moment. It will now be pertinent to test their validity against the spatial record.

Bearing in mind the diachronic formation of a settlement (see chapter 1), the intra-locus investigations will be conducted with a recurrent sequence of analyses.

After a general presentation of the locus and of the observations recorded in the field, we shall first focus on the vertical distribution of the various artefact categories, in order to obtain a general idea of site 'disturbance'. The refitting results will be fully exploited in this part.

Next, we shall examine the overall structure of the place, i.e. investigate whether or not remnants or indices of 'site architecture' can be found. As outlined in chapter 1, these structural features (hearths, dwellings) are normally established during the initial phase of habitation, and will largely determine the location of subsequent activities. At Rekem, the group of non-flint rocks is assumed to have played an important role in this respect. Next to their significance as individual tools, their distributions often provide the only means for the reconstruction of fireplaces or other structures. The results of the refitting will prove to be of substantial value here, as these rocks were intensively transported and reused. Being larger items, it is not surprising that they were repeatedly recycled, therefore reducing the need to procure 'fresh' material. For the same reason, they were probably visible on the surface for longer than the flint artefacts, and could therefore be more easily 'scavenged' by any later occupants.

The next stage in our investigation will generally deal with aspects of flint knapping and the spatial output of this activity. The refitting results will again be crucial here, but we shall also deal with flint types (raw materials) and the distribution patterns of chips, etc. This part is particularly meaningful for an evaluation of the horizontal *in situ* character of the assemblage, as flint knapping normally produces specific patterns of debitage dispersal. Possible indirect evidence for the presence of dwellings (*e.g.* 'wall effect') and other structures are also examined in this part.

The next sections will focus on the activities in which flint artefacts served as tools in a functional sense. At Rekem, these activities are almost exclusively related to the procurement and processing of animal resources. Except for 1 burin spall used on reed, and some woodworking traces, no indications of plant working have yet been observed. Again, the activities are discussed in the (presumed) sequence of execution: procurement (*i.e.* hunting), butchering, the processing of soft animal matter (esp. hide working) and, finally, the processing of hard animal matter (bone and antler work). Although occasional overlap occurred, at Rekem these stages are closely correlated with the main tool types: slender LMP for hunting, large LMP (and some truncated blades) for butchering, scrapers for hide working, and burins, borers, becs, and reamers for bone and antler work. The detailed spatial analyses of the tools and their manufacturing waste products are presented and discussed in sections 6.3.4-6.3.8. We shall systematically refer to these sections in our preceding discussion by locus (section 6.2), and shortly summarise the most significant results. Obviously, this part basically relies on the results of the functional analysis, but it will also deal with the manufacturing and use-lives of the tools (i.e. refitting of tool waste) as well as with the causes of rejection. The latter evidently influenced the ultimate disposal of the tools. Finally, we shall also present some arguments for a reconstruction of the sequence of activities, focusing on indices of artefact recycling.

Together, these analyses should provide insights into the overall patterns of task organisation and lead to a satisfactory identification of the behavioural

6 Yellen 1977.
7 Murray 1980.

Table 158
Rekem habitation zone 1. Number of flint tools and tooling waste products individually plotted on the maps at the various loci (randomly retouched tools and retouch flakes not included).

Tools	Locus 1	4	5	6	7	8	10	11	12	13	15	16	Total plotted	Total
Lateral modified laminar piece: slender	38	2	85	41	19	-	40	17	29	1	-	2	274	282
Lateral modified laminar piece: large	10	-	12	4	20	-	1	12	4	-	-	-	63	64
Burin	18	4	85	44	2	-	46	19	12	-	2	6	238	261
Scraper	7	1	56	33	5	3	6	7	18	-	-	12	148	162
Truncated tool	16	2	10	12	7	-	7	3	1	-	-	5	63	73
Borer/bec/reamer	-	-	15	6	-	-	10	1	2	-	-	2	36	40
Composite tool	1	-	5	3	1	-	4	1	1	-	-	1	17	18
Total N plotted tools	*90*	*9*	*268*	*143*	*54*	*3*	*114*	*60*	*67*	*1*	*2*	*28*	*839*	
Total N tools	110	11	270	175	54	3	115	61	70	1	2	28		900
Krukowski microburins	5	-	4	-	17	-	1	9	4	-	-	-	40	42
Burin spalls	24	-	141	59	1	-	44	36	25	-	1	10	341	356
Total N plotted tooling waste	*29*	*0*	*145*	*59*	*18*	*0*	*45*	*45*	*29*	*0*	*1*	*10*	*381*	
Total N tool waste	35	1	145	65	18	0	45	45	32	1	1	10		398

processes that generated the archaeological record at the various loci. The final section of this chapter will explore recurring phenomena, discuss more general themes, and present global interpretations regarding habitation zone 1.

Some final words for the reader. The following analyses consider all tool categories and their waste products, except for the randomly retouched tools. For the general discussion on type frequencies, production places, use rates, etc. by locus, all items of habitation zone 1 (900 tools and 398 tooling waste products) are taken into account. For the specific intra-locus spatial analyses, the 61 tools and 17 tooling waste products without exact co-ordinates could not be included. Table 158 shows the number of tools individually mapped by locus. Finally, as this chapter primarily builds on the results of the preceding analyses, we will frequently refer to tables, figures and earlier discussions as well as to the plates presented in volume two. Volume two also contains the numerous maps that accompany this spatial analysis and that should appease its 'consumption'.

6.2 Intra-locus analyses

6.2.1 Rekem 15

6.2.1.1 Field observations and vertical distribution

So far, Rekem 15 is the latest unit to have been discovered at Rekem[8]. It was excavated during the final field season of 1986 (end of August and beginning of September) after a trench of the 1982 campaign[9] (fig. 1) was reopened. No lithic artefacts had been reported from this trench during the former excavations, but it was considered useful to test the NE periphery of the central settlement area of the *Federmesser* site.

The first artefacts from Rekem 15 were discovered just below the base level of the 1982 excavation, some 4 to 5m NW of Rekem 16 (fig. 1). They were immediately recorded in three dimensions and drawn to scale on the excavation maps (Map 14). Small chips were also indicated on the field maps, but bagged collectively per square metre (i.e. recording method B; see chapter 2). The field book does not mention any specific disturbances in this sector. Horizontally, the scatter was restricted to a small area. On a total excavated surface of 36 sq m, only a few square metres were occupied arranged in a central cluster with some peripheral finds.

Stratigraphically, the artefacts were situated in the upper part of a homogeneous layer of yellow sands, similar to the position of the artefacts at the other concentrations. The vertical distribution was moderate in the context of the site, but still had a maximum dispersion of 30 cm (fig. 79). About 60% of the artefacts were situated between 9.16 and 9.09m. There was no significant correlation between the angles and depths of the artefacts. Most elements were reported to have been 'horizontal'. The prehistoric surface at Rekem 15 was probably level (no slope).

On the other hand, a certain vertical size sorting of the artefacts may have taken place. All the cores and the larger non-flint-rocks were found in the up-

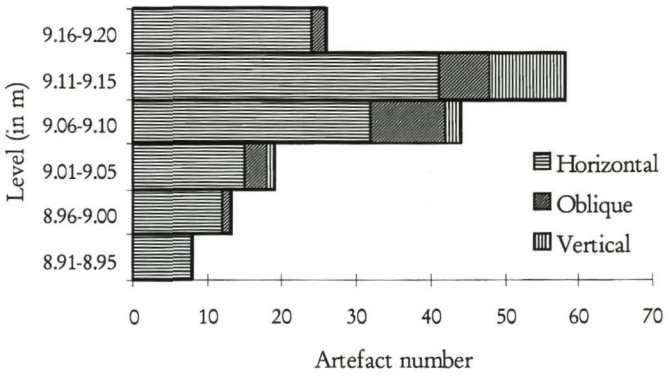
[8] This locus was first called Rekem 17, but received a lower number when it appeared that there was actually no Rekem 15.
[9] De Boe 1983a.

per part of the vertical distribution (fig. 80) while the smaller elements were generally situated somewhat deeper. This is somewhat opposite to the model of '*a significant increase in size (weight) with depth of burial*', which was claimed at Hengistbury Head[10] assumed to result from various types of (small-scale) biological activity. However, experiments with deep-burrowing earthworms, conducted by Armour-Chelu and Andrews[11], divulged that, on average, smaller elements (bones) dispersed to a greater depth than larger ones. Such 'contradictions' indicate that vertical size-sorting effects of small-scale bioturbation are still poorly understood.

The same may be true for our present knowledge of vertical size sorting induced by cultural formation processes (mainly trampling), although an ever-expanding literature is being published on this topic. While some authors have suggested that trampling generates a vertical size sorting effect, with the larger pieces occurring near the ground surface and smaller items being pushed down[12], others have failed to reproduce this pattern[13]. The degree of downward movement also varied considerably, reaching as much as 16-18 cm in Stockton's experiments, against hardly a centimetre in Barton's test cases[14]. Little is presently available from ethno-archaeological observations, although Yellen[15] noted that near to !Kung San hearths, smaller items were more susceptible to downward migration than were larger objects.

Until more agreement can be reached on such topics, the causes of vertical displacement cannot be ascertained without caution. At Rekem 15, it may be stipulated that the vertical size-sorting co-varies with the fact that larger elements were outside the denser part of the concentration (see below and fig. 83), and were possibly less affected by trampling. It can, however, also be argued that trampling in general may have hardly affected this limited activity area (see below).

79 *Rekem 15. Level of artefacts according to dip.*



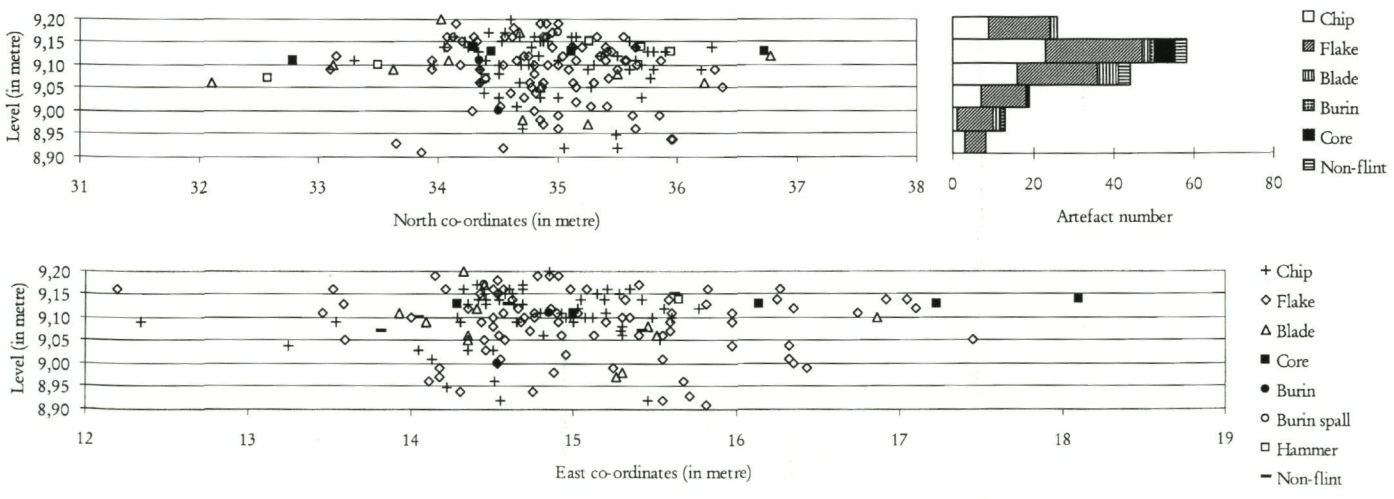
6.2.1.2 *General description of the assemblage, and observations from previous analyses*

The artefact inventory of Rekem 15 is very restricted. It includes 181 pieces of flint (2 burins, 1 burin spall, 82 flakes, 9 blades, 3 crested blades, 2 core sides, 5 cores, and 77 chips; Table 13) and 6 non-flint rocks (1 quartzite hammerstone, 2 quartzites with a flaked edge, 2 fragments and 1 complete manuport; Table 8 & Table 11). No haematite was found. In all, 1.98 kg of flint and 3.30kg of other mineral remains had been transported to the site (Table 7). This is a volume that without too much effort may have been carried there by one person in a single trip.

Except for the smallest example, all cores display 2 striking platforms. They do not seem to be exhausted, but were abandoned in an early stage. The high core ratio (1 for 20 artefacts, chips not counted), the predominance of cortical pieces, the low number

[10] Collcutt 1992, 74.
[11] Armour-Chelu & Andrews 1994.
[12] Stockton 1973; Courtin & Villa 1983.
[13] Gifford-Gonzalez *et al.* 1985; Barton 1987.
[14] Stockton 1973; Barton 1987.
[15] Yellen 1977, 103.

80 *Rekem 15. Vertical distribution of various artefact types, along N-axis (above) and E-axis (below).*



of rejuvenation elements (restricted to 1 crested blade) and the high predominance of flakes over blades together indicate that primary flaking was the main objective.

The tool rate is also extremely low (less than 2%). The two burins are both atypical Lacan types, and are stylistically very similar (Pl. 88: 3,4). They are made on cortical blanks and have their burin edge on the proximal end and on the left side. The edges are further retouched on all sides. This resemblance could suggest that the same craftsman was responsible for the making of both these tools.

Other artefact edges at Rekem 15 are mostly undamaged, while only a limited number of pieces were broken. Microscopically, except for 1 element showing a moderate alteration, all analysed artefacts (N=24) appeared to have 'fresh' edges and surfaces. Yet, not a single trace of use-wear could be detected either on the blanks or on the burins.

As a preliminary image, all this seems to suggest that activities (trampling included) were extremely limited at Rekem 15, and were mainly restricted to the reduction of a few nodules, possibly by a single person. There are no indications of a hearth. The flint artefacts did not show traces of burning, except on a core found in the periphery (possibly affected subsequent to the occupation) and on one broken slab that may have been transported to the site in an already burnt state.

The general interpretation of Rekem 15 as a limited knapping place can be sustained by the raw material and refitting analyses. At the time of writing, from all units in Rekem, the refitting rate is highest at Rekem 15. Sixty-five elements could be included, representing 63% of the flint artefacts (Table 26). All the cores (Table 29), as well as both the burins (Table 80), were incorporated in the refitted co-sets. The refit-rates of flakes and blades are similar (close to two thirds).

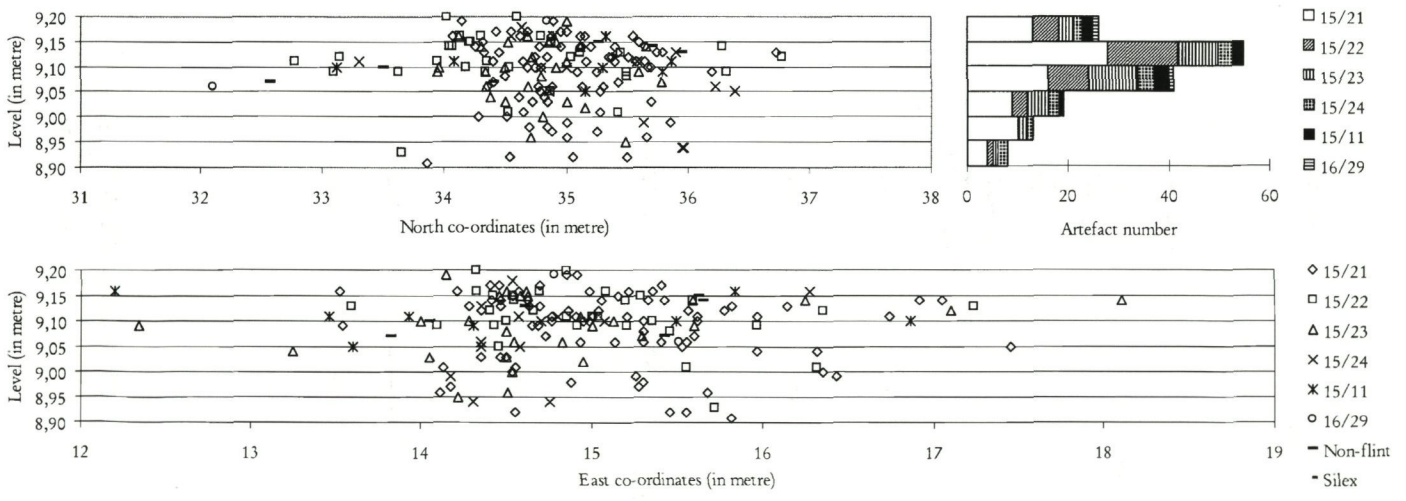
Because of its potential significance for intra-site analysis, and the relatively low number of artefacts, all pieces of Rekem 15 were included in the database used for spatial analysis. It was *de facto* possible to ascribe most artefacts to 6 well-distinguished individual flint types, generally coinciding with the refitted co-sets (see description in section 4.2.2.2). Only the specific flint type of the smallest (coarse-grained) flakes (chips) could not be exactly established. They are described as type 15/20. The number of artefacts by flint type, and the flint type of the various refitted (co-)sets is as follows:

Flint type 15/21: N=80; (co)sets 15c01, 15c02, 15c04, 15s06, and 15s07.
Flint type 15/22: N=31; (co)sets 15c03, 15c06, and 15s03.
Flint type 15/23: N=28; (co)sets 15c05, 15s04, and 15s05.
Flint type 15/24: N=13; sets 15s01 and 15s02.
Flint type 15/11: N=8; no refits.
Flint type 15/20: N=19; no refits.
Flint type 16/29: N=2; both members of this type belong to the big co-set 16c01 that was distributed over Rekem 16, Rekem 12, and Rekem 15 (Map 106).

Except for the 8 artefacts of flint type 15/11, that may have been introduced to the site in a finished state, and the 2 refitted elements of flint type 16/29, that came from Rekem 12 and (possibly) Rekem 16, it is very likely that all other artefacts were knapped locally at Rekem 15. The plotting of the vertical dispersion by flint type did not reveal any distinction (fig. 81).

More than 60% of flint types 15/21 to 15/24 could be refitted and it may be presumed that the unrefitted state of many of the remnant artefacts is simply due to the failure of the refitters, partly through lack of time, as well as to the fact that some intermediate elements had probably been transported away from the locus. Even with the unrefitted arte-

81 *Rekem 15. Vertical distribution of various flint types, along N-axis (above) and E-axis (below).*



facts incorporated, it is clear that the reduction sequences cannot be completely reconstructed with the pieces from Rekem 15 alone.

From the detailed description of the reduction sequences of the most important refit-sets (co-sets 15c01 to 15c06; see section 4.4.2.10 and Pl. 60-Pl. 62) we can conclude that:

a) The original nodules were medium-sized, with maximum dimensions often below 10 cm.
b) Core preparation was absent or restricted to an absolute minimum.
c) The reduction sequences were generally organised from two opposed striking platforms that were used successively, partly exploiting the same core table. Some sequences were almost identical (*e.g.* 15c01 and 15c02).
d) Most cores were abandoned at an early stage, after severe hinging or (in one case) after plunging had damaged part of the core tables. These were not repaired.
e) The output (productivity) of the reduction sequences was poor, both in quantity and in quality (very few blades, and none of good quality; two tools only).
f) There was little variance in the knapping procedures.

On the whole, the quality of knapping can be estimated as 'poor', even in the general Rekem context. Furthermore, butt preparation is absent or restricted to an extreme minimum while wide butts, pronounced bulbs of percussion and several other features indicate that direct hard hammer percussion had been applied. In fact, one manifest quartzite hammer was found amongst the debitage, while the size and shape of two other quartzites would also have been perfectly suitable as hammers. It may therefore be concluded that very few factors need to be invoked to account for the creation of this total assemblage. The features 'fossilised' in the reduction sequences and in the layout of the tools show a great consistency, as if few hands have been responsible for their manufacture. In fact, a single flint knapper may have produced the entire collection in a short period of time. Given the homogeneity of the assemblage, and its internal structure, it is unlikely that Rekem 15 represents a secondary deposit or dump[16].

For an evaluation of the spatial preservation of the locus, this situation is almost ideal. In the next paragraphs we would therefore like to explore in some detail the degree to which the spatial dimension of this 'simple and single' event corresponds with the expected patterns of debitage dispersal generated by percussion flaking.

6.2.1.3 *Spatial patterns of flint knapping*

If the interpretation so far is correct, then we may expect a certain patterning in the spatial layout of this flint scatter. Parallels from knapping experiments[17], ethno-archaeological research[18] and Palaeolithic sites from undisturbed contexts[19] together offered inspiration in the formulation of a few (simple) hypotheses regarding the spatial output of the flint working:

a) Pieces that had been imported to the site as individual implements were distributed differently to the locally produced artefacts.
b) The knapping area is best determined by the smallest particles (chips), as these drop nearby, and are normally of no further interest to the knapper. They should cluster more densely than larger pieces that may encounter a secondary manipulation[20]. The opposite situation could imply that chips travel further under small-scale bioturbation.
c) Abandoned cores are put aside or tossed away from the central knapping area because they are large and obtrusive items[21].
d) Tools are kept apart.

These hypotheses can be easily examined on the thematic maps and tested by means of the simple calculations of centroids[22] and artefact distances.

The various maps of the refitted sets and co-sets at Rekem 15 (Map 98-104) show that the reductions are not spatially segregated. This suggests that the knapper(s) did not change position much while reducing the various nodules.

The thematic map of the different flint types (Map 114) sustains this image. Flint types 15/21, 15/22, and 15/23 cover more or less the same area. Type 15/24 seems slightly more concentrated towards the NW part of the scatter. Since this flint type does not include a core, it cannot be fully asserted that the (partly refitting) blanks were indeed knapped locally. In any case, artefacts of flint type 15/11 were clearly introduced into the locus as finished implements and they show a completely different pattern, with a much wider dispersion over the area. Finally, with only two imported elements, the significance of flint type 16/29 is naturally limited.

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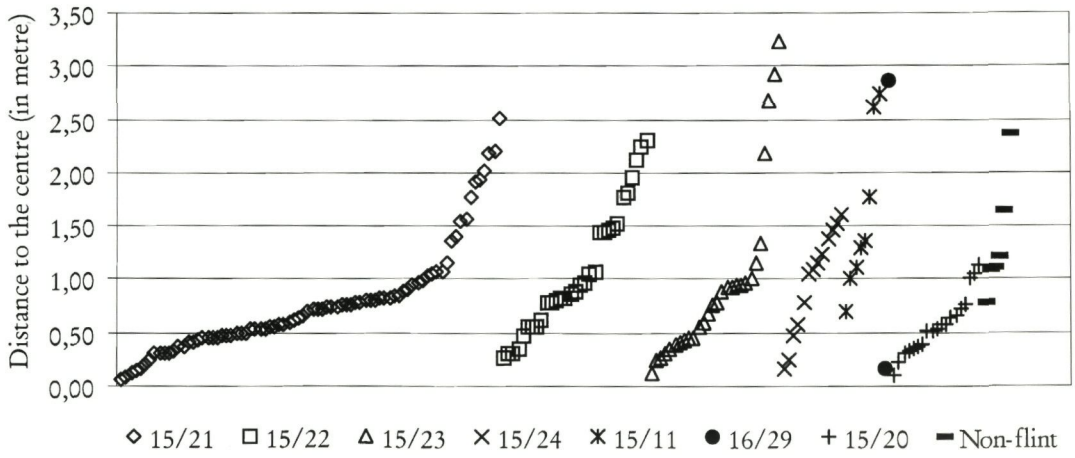
16 Behm 1983.
17 *e.g.* Newcomer & Sieveking 1980; Fischer 1990; Kvamme 1997.
18 *e.g.* Binford 1978, 1983; O'Connell 1987.
19 *e.g.* Etiolles and Pincevent: Pigeot 1987; Bodu 1993.
20 cf. Binford 1983, 152: "*Another important observation about site structure can be illustrated by stone tool manufacture among the Alyawara Aborigines in Australia. In one case I watched a seated worker knocking flakes off a core. The tiny chips created as a result of this flaking would later provide a clue to where the man had been seated, because they fell between his legs and were left in place. The flakes, however, were arranged carefully in an arc in front of him. The shape and size of this arc were determined by the length of the man's arm. A similar pattern was also created in a very different part of the world (northern Alaska), where I have observed some very old men working stone.*" Comparable manipulations were equally perceived in controlled flaking experiments: "*La seconde différence provient d'habitudes personnelles dans la mise à l'écart de gros éclats et de fragments de blocs pour ne pas s'y blesser ultérieurement (...). Ceux-ci sont alors déplacés de quelques décimètres vers l'avant ou vers la gauche. La mise à l'écart des produits de débitage sélectionnés (bonnes lames) se fait aussi selon l'habitude du tailleur, vers la droite et un peu à l'écart de l'amas (...)*" (Boëda & Pelegrin 1985, 33).
21 Binford 1978. In any case, the process that governs most debitage deposits (dropping, as a direct result of knapping), is not relevant for cores. The (primary) position of cores is generally a result of throwing or placing, actions that are both directly controlled by the hand of the actor.
22 Point defined by mean N co-ordinate and mean E co-ordinate of the population.

82 *Rekem 15. Distance of various flint categories to their common centre (N34.89 E14.93).*



A different (one-dimensional) view of the dispersal mode of the various flint categories is shown on fig. 82. This shows that the artefacts of flint type 15/21 to 15/23 cluster tightly within one metre from the common centroid and have outliers further away. By contrast, the few artefacts of flint type 15/24, but certainly of types 15/11 (and 16/29), clearly do not cluster around the centroid but instead most of their elements are situated at a distance of more than 1m and almost up to 3m. The category 15/20 on this (and other) graphs represents the small chips that were recorded individually on the field plans, but then bagged together. It was therefore not possible to map their individual flint type. Most, however, are clearly of flint types 15/21 to 15/23.

Yet another overview of the dispersion mode of the various flint types is presented in Table 159. Several indices were calculated here to characterise the position and density of the various flint type distributions. Firstly, the table confirms that flint types 15/20 to 15/23 cluster tightly. Their centroids (averages of North and East co-ordinates) are concentrated in an area of less than 1/4 sq m.

Most relevant for the density analysis are the values 'Radius' (the sum of the standard deviations to the mean of North and East co-ordinates of each flint type) and 'AD' (average distances to the flint type midpoints). Both values are measures of how widely the artefacts are dispersed from their respective centroids. The table reaffirms that flint types 15/11 and 16/29 clearly deviate from types 15/20 to 15/23. While the latter are on average between 0.5m to 1m from their midpoints, flint type 15/11 reaches an average of 1.5m, close to the result for non-flint rocks.

In conclusion, the different deposition histories of flint types 15/11 and 16/29, presumably not knapped locally, seem to be retained in the present-day distribution maps (= hypothesis a, above).

For an examination of the other hypotheses, we have produced maps, graphs, and tables of the various artefact categories. The mapped distribution of the different artefact types (*e.g.* Map 98) immediately reveals that at least some of the expected patterns have been preserved. Both the burins, for instance, are closely together on the SW side of the scatter (see postulate d), while the burin spall is not far away. Furthermore, the cores are clearly situated in a peripheral position (hypothesis c).

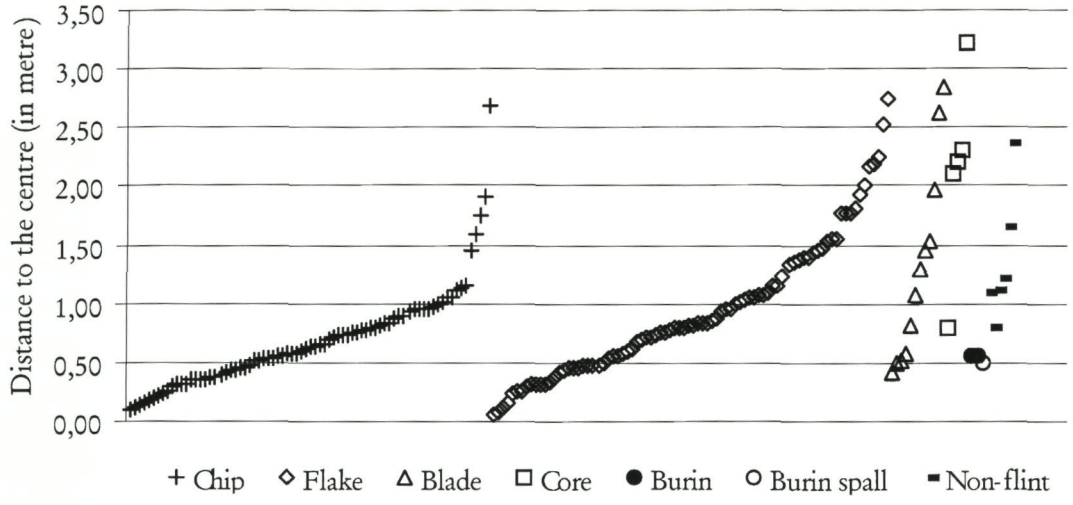
For a closer inspection of hypothesis b, fig. 83 may be more illustrative. One notices that the chips are almost totally constrained within 1m from the scatter centroid. Flakes disperse a bit further, whereas most blades were found outside the 1m limit. The peripheral position of the cores (generally more than 2m from the centre) and the closeness of the burins and spall are also well illustrated here.

Table 160 provides similar results, but in this case with regard to the distances of the artefact types from the midpoints of their respective categories. One also notices that the core centroid is more than 1m further East than the centroids of chips, flakes and

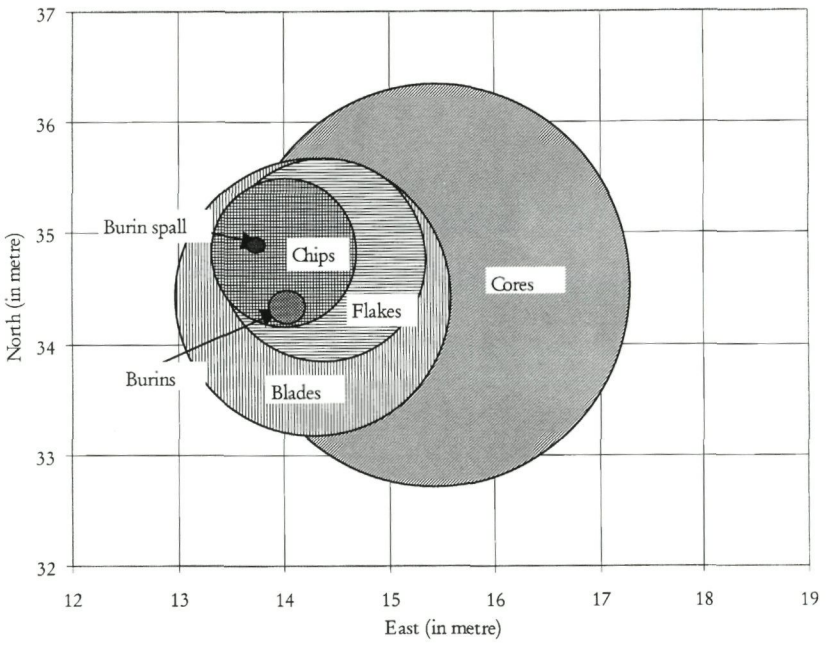
Table 159
Rekem 15. Indices of position and dispersal of various flint types.
Legend: N = Number of artefacts; CNy = Mean North coördinate; CEx = Mean East coördinate; SDNy = Standard deviation of North coördinates; SDEx = Standard deviation of East coördinates; Radius = (SDNy + SDEx); Area = surface area in m^2 of circle with (SDNy + SDEx) as radius; AD = Average of absolute distances from artefacts to the midpoint (CNy,CEx) of their population.

Flint type	N	CNy	CEx	SDNy	SDEx	Radius	Area	AD to C (Ny,Ex)
Flint 15/21	80	35.02	15.11	0.52	0.74	1.26	4.97	0.77
Flint 15/22	31	34.57	15.03	0.92	0.74	1.66	8.65	1.01
Flint 15/23	28	34.78	14.80	0.47	1.06	1.53	7.36	0.87
Flint 15/24	13	35.29	14.68	0.94	0.85	1.79	10.11	0.85
Flint 15/11	8	34.94	14.46	0.86	1.41	2.27	16.25	1.49
Flint 16/29	2	33.48	15.15	1.37	0.37	1.74	9.51	1.42
Flint 15/20	19	34.99	14.65	0.38	0.41	0.79	1.94	0.50
Non-flint rock	6	34.57	14.86	1.22	0.74	1.96	12.06	1.38

83 *Rekem 15. Distance of various artefact categories to their common centre (N34.89 E14.93).*



84 *Rekem 15. Schematic (mean) horizontal spread of various artefact types. Radii of circles are average distances to the midpoints.*



blades, all of which are situated close together. This tendency has already been observed on the artefact maps and on the map showing all refits (Map 105). In general however, the core dispersion displays a more or less circular outline.

Most illustrative for the purposes of comparing density, is the gradual tendency to the wider dispersion that is shown by the indices 'Radius' and 'Average Distance to the centroid'. Both measurements gradually range from respectively 1.11 and 0.67 for chips (*i.e.* tight cluster), to 2.68 and 1.86 for cores (*i.e.* widely dispersed) while flakes and blades are in between. The table almost perfectly matches hypotheses b and c in that the chips are indeed the most densely clustering artefact category while flakes and blades travelled further, and cores were clearly removed (tossed away). A schematic representation of these calculations is provided by fig. 84 that shows the mean horizontal spreads of various artefact types from their respective midpoints.

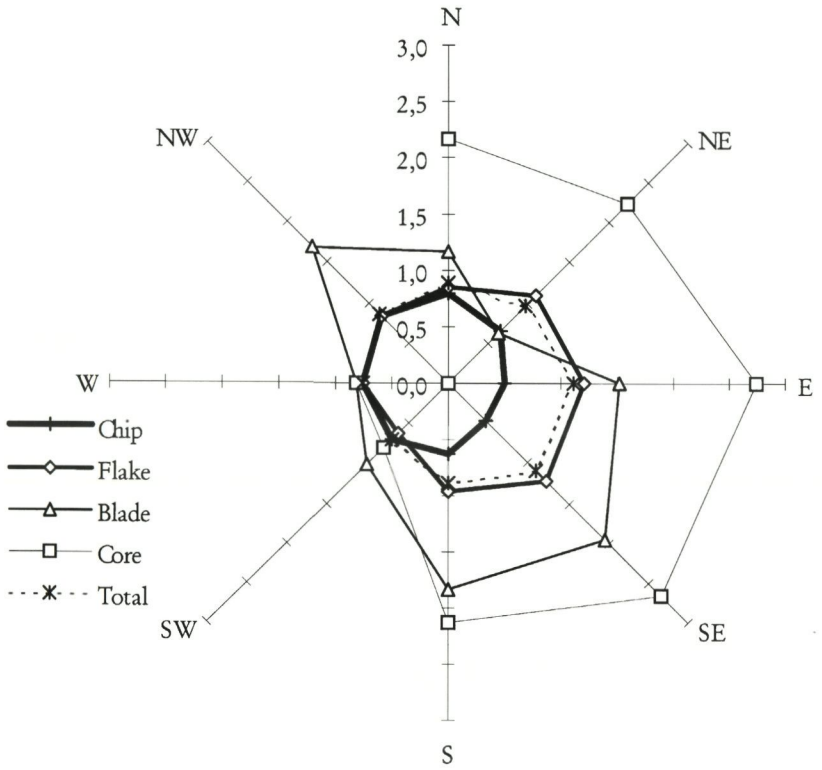
However, since the circular form of the distributions seen in this representation is postulated rather than demonstrated, fig. 85 may be visually more accurate. It shows the mean distances of the various artefact categories from the common midpoint, calculated in eight circle sectors, and reveals that, indeed, not all the distributions have a circular pattern. The blade distribution, for instance, displays a quite different shape, probably reflecting specific deposition processes (although the limited number may also play a role). The asymmetric shape of the core distribution, with a strong eastern tendency, has already been noticed above[23].

Finally, if one accepts that Rekem 15 can be considered a short-term, poorly maintained activity area, the analyses demonstrate that cores were indeed frequently removed (tossed away) at the end of the knapping procedure. In other words, their peripheral position is not necessarily due to the scuffage or cleaning of a central area during the subsequent occupation as might have occurred, for example, in-

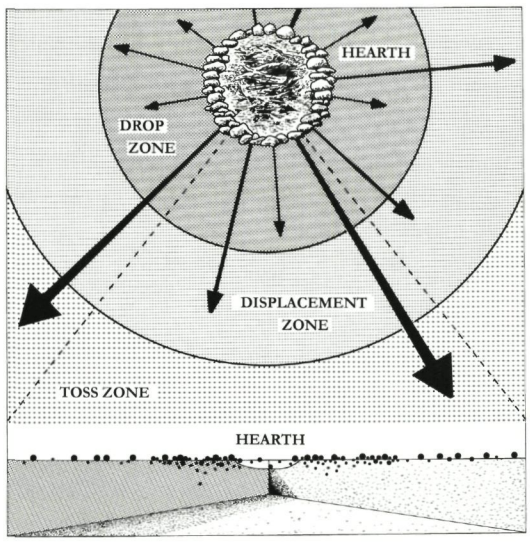
Table 160
Rekem 15. Indices of position and dispersal of various artefact types.
Legend: N = Number of artefacts; CNy = Mean North coördinate; CEx = Mean East coördinate; SDNy = Standard deviation of North coördinates; SDEx = Standard deviation of East coördinates; Radius = (SDNy + SDEx); Area = surface area in m^2 of circle with (SDNy + SDEx) as radius; AD = Average of absolute distances from artefacts to the midpoint (CNy,CEx) of their population.

Artefact type	N	CNy	CEx	SDNy	SDEx	Radius	Area	AD to C (Ny,Ex)
Chip	77	34.97	14.72	0.56	0.55	1.11	3.86	0.67
Flake	84	34.91	15.09	0.63	0.90	1.53	7.34	0.95
Blade	12	34.58	14.86	1.25	0.81	2.06	13.26	1.29
Core	5	34.68	16.15	1.28	1.40	2.68	22.55	1.86
Burin	2	34.43	14.69	0.08	0.16	0.24	0.18	0.18
Spall	1	35.00	14.45	0.00	0.00	0.00	0.00	0.00

85 *Rekem 15. Mean distance (in metre) of various artefact types to their common centre (N34.91, E14.95), in 8 sectors.*



86 *Above: Model of flow of refuse produced in the vicinity of exterior hearths according to size sorting. Line weight is positively correlated with object size.*
Below: Schematic cross-section of abandoned hearth area showing the horizontal and vertical distributions in three size classes of objects according to size sorting (after Stevenson 1991: Figures 2 and 3).



side dwellings or around hearths[24]. In fact, our final result, the comparison of chips, flakes, and cores, perfectly matches the model of refuse flow as presented by Stevenson[25] (fig. 86). This implies a drop zone, a displacement zone, and a toss zone around hearths.

Of course, if maintenance or other secondary formation processes took place on the site, many would indeed rather increase the pattern of size-dependant differential displacement, instead of blurring it. Children's play for instance, often occurring on site peripheries, tends to move large items further from their original locus than small items[26]. But even then scuffage, cleaning or children's play are all cultural (behavioural) formation processes in this systemic context and therefore would not undermine the present inquiry. Although some natural phenomena reported in the literature (*e.g.* 'patterned ground'[27]) seem capable of horizontal size-sorting, it seems unlikely that these could be responsible for the specific patterns observed at Rekem 15. Obviously, possible size-sorting by carnivore activity is also irrelevant here, as we are exclusively dealing with lithic material.

In conclusion, at Rekem 15, a detectable resolution of horizontal spatial patterning, ascribed to human activity, has been preserved. Of course, this verdict does not at all exclude horizontal displacement by natural post-depositional processes. In fact, if knapping was performed seated on the ground then the original concentration would presumably be denser. Knapping experiments in a seated position frequently generate tight scatters of only half a metre diameter[28], clearly less than that which we observe at Rekem 15. However, a standing knapping position normally creates a larger and more diffuse scatter, of more than 2m diameter[29], similar to Rekem 15. Until external criteria can be found to determine the knapping position, it will therefore remain impossible to compute any 'measure of post-depositional displacement' on these grounds.

The analysis only indicates that the post-depositional 'background' effects were restricted in the sense that they did not prevent the positive recognition of the 'original' patterns, even for small-area activities, limited to within a few square metres. Most likely, the 'blurring' of the scatter after occupation essentially consisted of a limited 'random' displacement of the artefacts in all directions. This gives rise to optimism that also in the more complex sites around hearths, or inside dwellings, horizontal patterning may, to a large degree, be related to systemic human activities. On the other hand, the post-occupational displacement by biological agents may have partly depended on the quantity of remains of organic material left by the occupants. Bone and meat remains may have been scavenged by carnivores, plant material may have attracted a denser population of worms, which in turn enticed other burrowers and, later on, a more intensified vegetation may have existed on these 'rich' patches. In other words, it cannot be excluded that bioturbation was more intense at the 'living sites' (dwellings and large hearth

[23] The one-directional outliers are also responsible for the – at first sight surprising – irregular contour line of the total assemblage in such presentation (*e.g.* mean distance of 0.75m. in the western sector, versus 1.15m in the eastern sector).
[24] Stapert 1989; Stevenson 1991.
[25] Stevenson 1991.
[26] Hammond & Hammond 1981.
[27] Wood & Johnson 1978, 344.
[28] Newcomer & Sieveking 1980; Barton & Bergman 1982; Boëda & Pelegrin 1985.
[29] Newcomer & Sieveking 1980, fig. 8.

areas, *e.g.* Rekem 10, Rekem 5) than at short-term attended knapping spots like Rekem 15. Therefore, a systematic concern with all the possible effects of natural phenomena will also have to guide our efforts in detecting spatial patterns of human behaviour at the larger loci. First, we shall shortly focus on the other small knapping spots.

6.2.2 Rekem 16

6.2.2.1 Field observations and vertical distribution

Rekem 16 was discovered on August 4, 1986, immediately under the base level of the trench of the 1982 (proto)historic excavations. 97 sq m were troweled and all artefacts > 2 cm recorded in three dimensions and drawn to scale on the excavation plans. Smaller elements were plotted as points and bagged by square metre together with the chips collected from the sieve (*i.e.* recording method B). Disturbance by later occupation was not reported here.

The general plan of the artefacts from Rekem 16 (Map 15) shows some evident patterning. In the NW part of the trench (around N7E2), a dense scatter of flint artefacts has been recorded on a surface of about 4-5 sq m. SE of this debitage cluster, a large surface of some 6x5m (N1-6 E3-8) is strewn with dispersed artefacts, essentially tools and tool waste products, together with some isolated cores. In addition, this sector also contains a few rock tools comprising one broken hammerstone, a large bifacially shaped sandstone block, and a rock with random traces of flaking (Table 8), together weighing less than 4kg (Table 7). Although a few sandstone fragments may have been affected by fire, there is no evidence for a built hearth structure. However, two small concentrations of burnt flint in N6E2 and N4E4 suggest that small fires may have existed here.

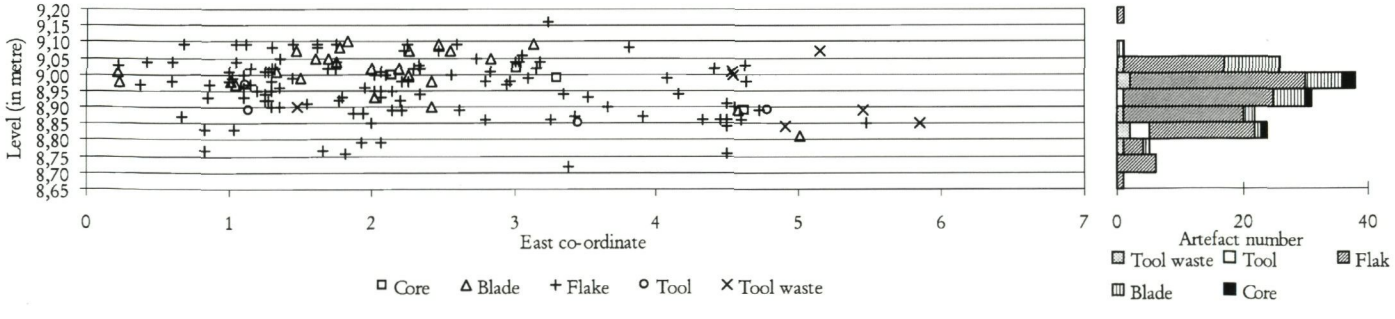
Based on the level of the refitted artefacts (and thus not including chips), the vertical distribution ranges from 9.16m to 8.73m, with a maximum at 9.00-9.10m, where most cores were also recovered (fig. 87).

6.2.2.2 Flint production and other activities

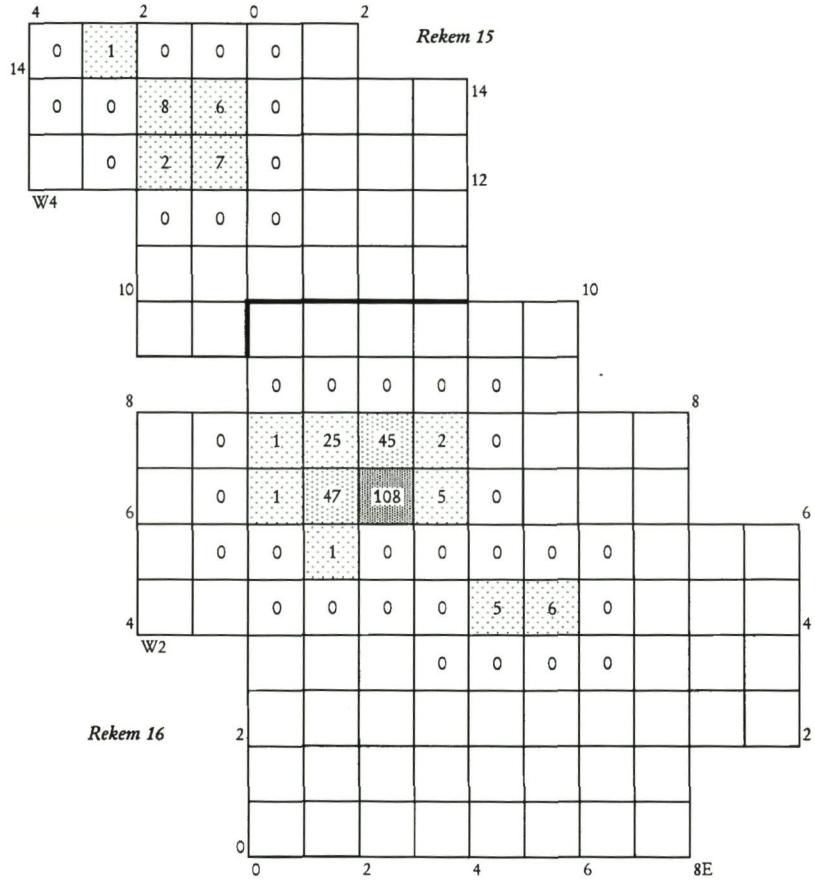
The total flint assemblage at Rekem 16 contains 11 cores, 339 blades and flakes (including 17 core rejuvenation products and 16 edge-damaged pieces), 398 chips, 17 lumps, 29 tools and 10 burin spalls (Table 13), together weighing slightly above 6kg (Table 7). Almost half of the artefacts (47%) could be refitted (Table 26) in 7 co-sets and 23 refit sets (Table 25). The tools are dominated by scrapers (N= 12), but there are also 6 burins (for 10 burins spalls), 5 truncated tools, 2 slender LMP, 1 bec, 1 reamer, 1 composite tool, and 1 randomly retouched piece (Table 34). The large majority of these items were suitable for microscopic analysis, but rather few pieces presented use-wear. Still, a whole range of materials seems to be worked here: carcass (1 scraper with an unretouched lateral edge), fresh/wet hide (2 scrapers), dry hide (1 bec and 1 edge-damaged piece), bone/antler (1 burin spall) and wood (1 scraper and 1 blade). In addition, MLIT were observed on the 2 slender LMP (presumably lost projectiles). One of these was found outside the trench, as was one burin that combined traces of dry hide working with use-wear of bone or antler work (see section 6.3.7.2). Except for these pieces, and one reamer associated with the debitage scatter, all the tools were situated in the low artefact density area in the SE sector of Rekem 16. The scrapers are mostly dispersed around a large empty zone in the southern part (*e.g.* Map 107) but some are also mixed with burins in the central area, lying together with a large number of frequently refitting burin spalls. None of the burins showed any traces of use. Whereas the flint type of these burins (16/21) is completely identical to that of the large refitted co-sets (16c03 & 16c04; Map 108-109) inside the debitage scatter, a physical link between both areas has not yet been established. Finally, it may be recalled that (part of) the large co-set 16c01 was also knapped in this SE sector, and distributed over a wide area. Full discussion of this particular sequence was presented in chapter 4 (section 4.4.2.11).

The main scatter in the NW part of Rekem 16 again appears as an almost classical configuration of

87 *Rekem 16. Vertical distribution of refitted artefacts from squares N4-9 E0-5 along E-axis.*



88 *Rekem 16. Distribution of flint chips by 1 m².*



a knapping spot, with cores abandoned in the periphery, and a dense concentration of chips. The latter especially occur in square N6E2, on the SE corner of the main scatter, with extensions in the adjacent squares to the N and to the W (fig. 88). In fact, this heart-shape pattern is, on a wider scale, mirrored in the overall distribution of the other artefacts with a tendency for larger elements to occur in two arcs on the N and W outskirts (Map 15). The refitting results fully confirmed this observation, as each half of the 'heart' corresponds with two reduction sequences (co-sets 16c02 and 16c05 in the N 'lob'; 16c03 and 16c04 in the W 'lob'; Map 107-110). Such a configuration is presumably best explained by inferring 2 adjacent knapping positions on this spot, with one knapper oriented to the N, and a second one oriented W (or, alternatively, a single knapper changing positions). Again, a very high spatial resolution appears to be preserved in this scatter.

Unlike Rekem 15, the layout of this concentration has not yet been further scrutinised and tested but the analogy is evident. Like Rekem 15, tools are also extremely rare in this knapping spot (1 reamer). Despite the presence of a range of tools in the adjacent low density sector, the ultimate purpose (production of specific tool types?) of the reduction sequences at Rekem 16 could not be retrieved.

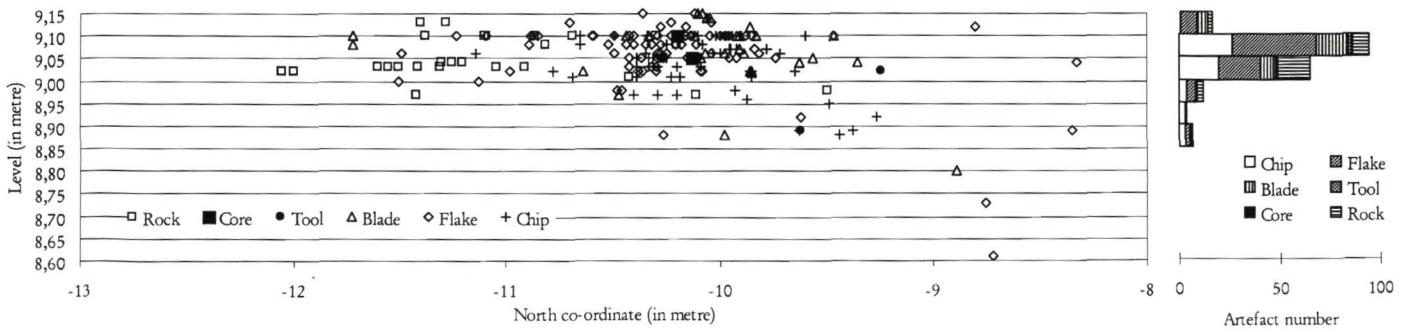
6.2.3 Rekem 13

6.2.3.1 Field observations and vertical distribution

Found during the 1985 campaign, it was initially assumed that Rekem 13 would represent an extension of Rekem 7, discovered in the adjacent 1984 trench (see section 6.2.4.). It soon became clear, however, that a sterile zone separates both clusters. Part of this intermediate sector, is considerably disturbed by Roman period structures (Map 19, Map 21), which presumably also affected the N part of the flint scatter at Rekem 13.

This obviously explains the outliers found at a depth of 8.60m in the N part of the vertical dispersion diagram (fig. 89). For the other pieces, the maximum dispersion is some 25cm, but more than three quarters of the flint artefacts are levelled between 9.01 and 9.10m. The cores, as well as the large non-flint rocks, are also situated on that level. Horizontally, the latter were all found S of the flint scatter.

89 *Rekem 13. Vertical distribution of various artefact types along N-axis.*



6.2.3.2 *Distribution of rocks*

Whereas sandstones, quartzites and quartzes constitute an insignificant part at most other small scatters along the E line of habitation zone 1, rocks at Rekem 13 are quite abundant (N=20; Table 11, corresponding with 11.8kg; Table 7) and reveal a clear pattern of organisation (Map 12). In addition to one broken hammerstone amidst the flint scatter, there is an elaborate 'structure' of sandstones separated from, but at the immediate S border of, the flint concentration. On a surface of about 1 sq m is an apparent grouping of some 20 rocks dispersed in a subcircular arrangement that widens and opens to the North. Except for a few specimens in the outermost part of this structure, all of the rocks are clearly affected by fire. It seems therefore, that we are dealing with an *in situ* hearth which has only partially been dismantled with the exception, perhaps, of the opening to the N and the few slabs laying in the immediate vicinity. As opposed to the situation at most other fire-related structures at Rekem, the hearth stones at Rekem 13 show hardly any fragmentation, suggesting that they were only slightly burned. Both the fact that this is a well preserved structure, with few *in loco* refits, and the fact that fragmentation is very limited may point to a relatively short use of this fire-place, perhaps just as long as it took to knap the flints (see below).

If this is correct, we need to explain why about 1/3 of the hearthstones were trimmed as 'heavy-duty tools' (Table 8; Map 21). Does this reflect the execution of additional tasks, performed here after the extinction of the fire? If this is the case, it is unlikely that their spatial distribution would still have depicted a hearth-like structure. The fact that at least 2 specimens were taken from Rekem 6 and 1 possibly from Rekem 10 (Map 25) rather suggests that these stones had served as heavy-duty tools elsewhere before they were transported to Rekem 13.

6.2.3.3 *Flintknapping*

The flint inventory for Rekem 13 consists of 4 cores (but only 2 are strictly associated with the scatter), 91 blades and flakes (including 6 core rejuvenation products and 4 edge-damaged pieces), 118 chips, 1 (burnt) slender LMP, 1 burin spall and 1 randomly retouched tool (Tables 13 and 34). In all this represents about 790g of flint (Table 7). Not a single piece appeared to have preserved traces of use.

The homogeneity of the flint type and the high refitting rate (53%; Table 26) together suggest that this locus represents very limited flaking activity. In fact, the refitted co-sets, the refit sets and most of the non-refitted artefacts, with the exception of a backed point and 3 cores, were possibly obtained from a single nodule. This evidently explains the limited dispersal of the flint scatter with most artefacts occurring on a surface of only 1 sq m. 'Extra-local', non-refitted cores are situated in the centre of this scatter, while the backed point is slightly removed to the NE. One large blade was transported 11m to the E. Refits also include a few pieces found on the S edge of the Rekem 7 trench but do not serve to connect both of the concentrations (Map 72).

The core of the knapped sequence at Rekem 13 could not be retrieved. In section 4.4.2.9, we suggested that the objective of this reduction would have been to replace the other exhausted core(s). It is likely that the knapper failed to 'finish' the sequence here as a result of the breaking of the hammerstone.

In view of the constrained horizontal distribution and limited variability of this lithic record, further discussion of the spatial analysis seems inappropriate. The spatial characteristics of this scatter clearly show, however, that in spite of a certain vertical distribution, the assemblage was hardly affected by post-depositional horizontal smearing.

6.2.4 Rekem 7

6.2.4.1 *Field observations and vertical distribution*

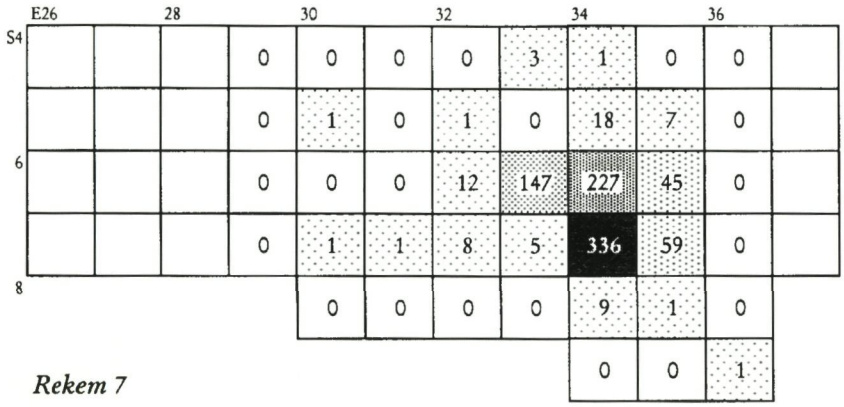
Rekem 7 was discovered towards the close of the 1984 season (October 16) when the base of a Roman period archaeological level was being shovel-cleaned. It was possible to excavate part of the scatter (mainly 4 sq m in S6-E32) that year. However, most work was undertaken two years later, in August 1986. In all, 56 sq m have been excavated in detail (Map 9). Only a small part of this area, in the eastern sector, contained a dense artefact concentration (Map 13).

Except for the few elements found during the discovery stage, all artefacts >2 cm were recorded in three dimensions and drawn to scale on the excavation plans. When smaller elements were found *in situ*, they were also indicated on the field plans, but bagged collectively per square metre together with the chips collected from sieving (i.e. recording method B).

Most of this locus was untouched by either subsequent occupation or earlier excavations. Some minor anomalies were noted outside the concentration of lithics, particularly in the N and SE peripheral areas (towards Rekem 13). One disturbance at the SW edge of the scatter may have partly affected the shape of Rekem 7, but because of its reduced depth, it did certainly not alter the layout substantially.

At first sight, the main scatter of Rekem 7 can be regarded as a well-delimited, dense, semi-circular concentration totalling about 5 sq m and surrounded by isolated stray-finds. However, closer inspection reveals an oval-shaped core area with axes of 2m N-S, and 1.5m E-W and enlarged with a small 'lobe' of about 1 sq m beside the NW edge of the oval. The distribution of the sieve-collected chips corresponds well with the general outline of this recorded scatter (fig. 90). In fact, the distribution of tools, raw material types, and refits also indicated that this refined partitioning is quite relevant (see below).

90 *Rekem 7. Distribution of flint chips by 1 m².*



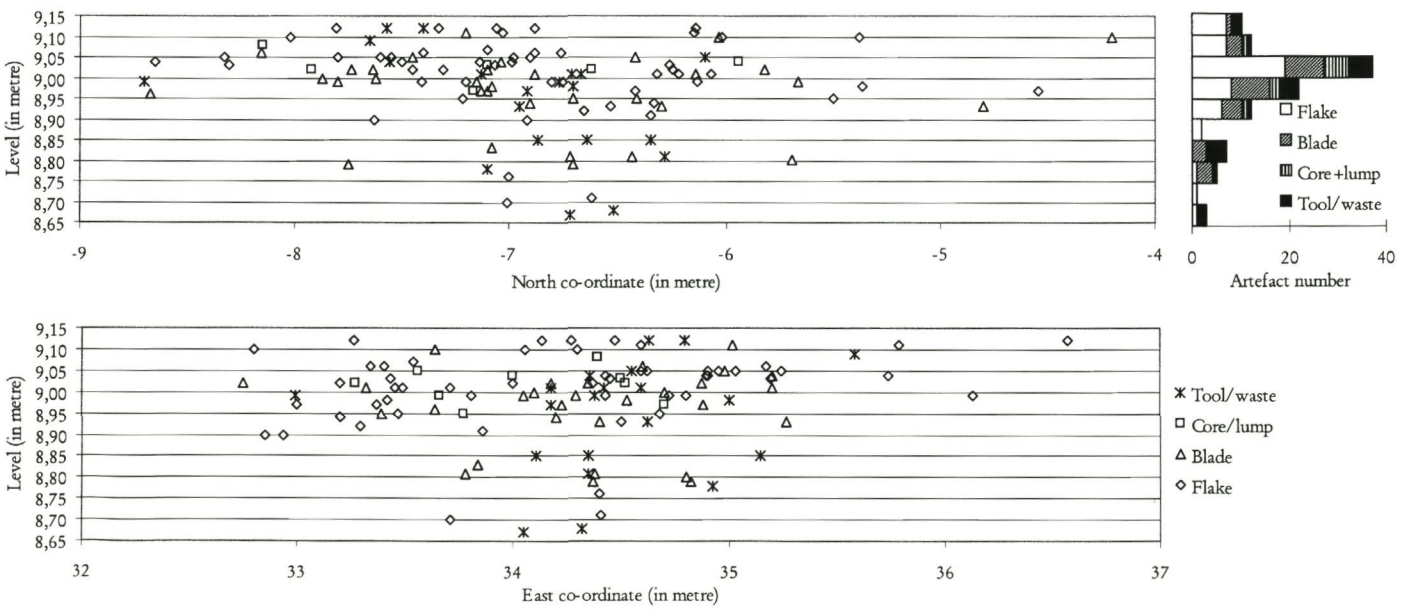
Stratigraphically, the artefacts were situated in the upper part of white-yellow sands, similar to the position of the artefacts at the other concentrations. The total vertical distribution was nearly 50 cm, a range that also contained the refitted elements (fig. 91). However, more than 85% were found in the upper half of the total vertical dispersion, namely between 9.12 and 8.90m. The heaviest elements (cores and lumps) were scattered even more tightly in the central part of that upper half. It seems that only a few elements, usually blade(let)s, small tools and tool waste, had been sporadically driven to a lower position. The detailed plotting of the refitted elements shows that this occurred in the central part of the Rekem 7 scatter (mainly in S6E34) suggesting that this phenomenon cannot be related to a position on a slope. Moreover, the lowest artefacts belong to a variety of raw materials and consequently to different refit sets, of which other elements are systematically found in the upper part of the vertical dispersion. The most likely explanation seems that individual biological agents have been responsible for the occasional downward migration of particular small elements. The migration of the bulk of the material, however, was rather limited. Its general distribution seems to suggest that the original living surface should be situated either somewhere between 9.10 and 9.00m, or else on top of this level, if the possibility of the upward movement of artefacts is excluded.

6.2.4.2 General description of the assemblage, and observations on previous analyses

The lithic assemblage at Rekem 7 consists almost exclusively of flint (Table 5). Except for some tiny, 'dubious' scraps and a few small quartzite flakes possibly related to a modification of one bifacially retouched 'heavy-duty tool', non-flint rocks are completely lacking. The few quartzite cobbles recorded in the extreme western part of the excavated area cannot certainly be associated with the actual scatter. One piece of haematite with one polished surface was encountered in the centre of the concentration.

The assemblage of flint debitage and tools collected at Rekem 7 is shown in Table 13. It only amounts to about 4.5kg (Table 7). Nearly two thousand artefacts have been counted, mostly chips with a maximum dimension of less than 2 cm. Only 658 pieces are of a larger size, including 55 retouched tools (8% if chips are not counted).

91 *Rekem 7. Vertical distribution of various artefact types, along N-axis (above) and E-axis (below).*



Two thirds of these tools are LMP (N=39), either slender (11 points and 8 bladelets) or large elements (6 pointed blades and 14 blades). The other tool categories are extremely limited: 2 burins, 5 scrapers, 7 truncated elements, 1 composite tool and 1 randomly retouched tool (Table 34). Borers or becs are completely lacking. Tooling waste includes one burin spall, and 17 Krukowski microburins.

The predominance at Rekem 7 of a single major tool category (LMP) already points at a clear 'specialisation'. Use-wear, refitting, and spatial analyses will further show that the manufacture of this tool type was in fact an almost exclusive goal at this locus.

At the time of writing, 145 artefacts from Rekem 7 have been analysed microscopically, including all tools and tool waste products (N=73) as well as 12 edge-damaged pieces and 60 specimens included in the refits. 22 elements showed alteration: 14 pieces were burnt and another 8 were affected by medium to strong "background noises" of natural origin (Table 1). In all, 131 elements (90%) were considered suitable for use-wear diagnosis. However, despite this excellent preservation in a Rekem context, only 5% appeared to bear positive traces of use: 3 slender backed points, used as projectile tips, a large backed blade used for butchering and two scrapers applied for hideworking. This means that none of the other tool types, nor any of the unmodified blades or flakes were used, or at least that they were not used intensively enough to develop recognisable traces.

19% of the artefacts from Rekem 7 could be involved in refits (N=126, if the two blades refitted in a co-set of Rekem 1 are also counted; Table 26). Another 6 elements from Rekem 1 have been further refitted into Rekem 7 sequences. It is our impression, however, that the refitting potential has certainly not been exhausted. This also applies to the tools, of which more than 31% could be integrated in refits (Table 37), mostly in reduction sequences.

The diversity of the raw materials found at Rekem 7 is rather limited. There is the unspecified fine-grained flint of 'Hesbaye-type' (7/10) on the one hand and 3 varieties of coarse grained flint on the other hand (types 7/21, 7/22, and 7/23; see section 4.2.2.2). It is quite evident that several of the sets and co-sets of a specific flint type, while not yet physically connected, do actually belong together. In other words, only a few blocks seem to have been reduced at Rekem 7.

Flint type 7/10

Although the fine grained flint variety probably comprises several subgroups, it seemed impractical to accurately subdivide this category into 'individual blocks'. A connection can, however, be suspected between the single co-set in this flint type (07c07; Pl. 48) and some sets which include backed pieces. The technological description of co-set 07c07 (section 4.4.2.5) reveals that it was in fact perfectly suited for the provision of the necessary blanks for LMP production, specifically regular blades from 4.5 to 8 cm long. These sizes perfectly agree with the proportions of the LMP reconstructed in the sets (07s30 and 07s32) and with the other abandoned backed elements of flint 7/10. Except for some atypically retouched tools, no other tool types but LMP (and several Krukowski microburins) have been found in this raw material. One of them, a well-elaborated ('finished') curved backed point (Pl. 75: 2) was eventually discarded at Rekem 1. The spatial position of the others is documented below. In sum, the exploitation of flint type 7/10 seems to be completely directed towards the manufacture of LMP.

Flint type 7/21

The technological analysis reveals that the knapping methods observed on the three co-sets (07c06, 07c08, and 07c09) in flint type 7/21, show great similarities (Pl. 48; see section 4.4.2.5). These include a regular laminar reduction, alternatively exploiting two opposed and frequently renewed platforms, repeated cresting, etc. These co-sets also contain the same (combination of) tools (LMP and burins) and all integrate at least one element from Rekem 1. It is, in sum, likely that they actually belong to a single sequence. Next to these co-sets, the smaller refit-sets in flint type 7/21 may also be ascribed to this sequence. These comprise two sets of laminar flakes (07s12 and 07s34), a set of tabular flakes (07s13), a refit of a pointed blade with a truncated blade (07s36), a burin spall on a burin (07s37), and a backed point with its refitted Krukowski microburin (07s29). It can even be predicted in which position these sets and the co-set may eventually be conjoined with each other.

Because of the particular appearance of flint 7/21, it is easy to segregate unrefitted artefacts belonging to this same flint type. Most interestingly, these include a core and another 8 LMP. Accordingly, it appears that we are dealing with a single, locally completed reduction sequence that generated a high number of tools, and that displays the following characteristics.

Firstly, the four burins (three are physically refitted in reduction refits; two in a single sequence) are all made on thick crested blades and are single or multiple burins, either dihedral, on fracture facets, or on unmodified edges, but never really on truncation. Two of these burins (Pl. 72: 18, Pl. 77: 3), as finished implements or as tools *in spe(?)*, have been transported to Rekem 1, up to some 20m north. One, at least, was partly resharpened there as it refits with a secondary burin spall also found at Rekem 1 (Pl. 75: 8). It also showed intense use-wear on various IUZ, suggesting that it had been a curated tool that had been intensely used throughout its trajectory[30].

No use-wear traces were observed on the two burins nor on the burin spall found locally at Rekem 7. In fact, one burin (Pl. 84: 1) has a broken and very obtuse burin end. The other specimen, a multiple burin (Pl. 84: 2), was almost exploited like a core. It generated large removals on one side (*burin plan*) and was then heavily reduced at the opposite side (dihedral burin end). The refitted burin spall shows that

[30] Most likely, this trajectory was considerably longer than is suggested by the single straight line drawn on the map.

the reduction at this side even started with the installation of a small 'crest'. As at Rekem 15, both burins may be regarded as abandoned tools that were either lost, or considered unsuited for the purpose originally intended. In any case, the manipulation of burins at Rekem 7 reveals a pattern that is clearly different from the procedures observed at, for example, Rekem 5 (section 6.3.7.5.1).

Secondly, for the 14 LMP of flint type 7/21, the pattern of manipulation also seems quite coherent. Five of these (counting separately the two fragments making a single LMP) are refitted in reduction refits, twice associated in the co-sets with the burins (Pl. 72: 18, Pl. 75: 8) and once with a truncated piece (Pl. 75: 9). A sixth one refits with a Krukowski microburin (Pl. 72: 9). None of these, nor the eight other LMP of this flint type, display macroscopic damage or microwear that can be related to use. Most are clearly fragments broken in the production process and many have partly unmodified edges. The single exception is a nice complete, straight backed point (Pl. 72: 6) that was found slightly separated from the concentration. The spatial layout of this and other flint types will be discussed below (section 6.2.4.3).

Flint type 7/22:
Although this flint group includes several cores, it is not excluded that these originally belonged to a single large nodule. In fact, they all display similar surfaces provoked by natural flawing. At present, artefacts of this flint type are refitted in (co)sets 07c05, 07s01, 07s02, 07s07, 07s09, 07s21, 07s27, & 07s31. While the evidence seems less explicit this time, apparently the general goal was again the production of (blanks for) LMP. One of the discarded examples nicely illustrates the careful preparation of the point-tip before its accidental breakage (Pl. 72: 12-13). An obliquely truncated bladelet in this flint type (Pl. 101: 6) may possibly also be regarded as a piece discarded during an initial stage of LMP manufacture.

Flint type 7/23:
The technological description of both co-sets in this flint type (07c02 and 07c03; chapter 4) reveals a completely different reduction method and output that seemed unsuited for LMP manufacture (thick short flakes and laminar flakes). Although the flint type is less peculiar than, for example, type 7/21, two more sets (07s11 and 07s16) can be most likely ascribed to it. Again, none of these includes any tools. In all, it seems that the knapping of this sequence did not constitute the dominating activity of LMP production.

6.2.4.3 A knapping spot for LMP production

Together with Rekem 11, Rekem 7 has been identified as one of the small scatters with a very limited and specific activity range, focused on the fabrication of LMP. A synopsis of the arguments has already been published[31] and is also presented in section 6.3.4.1. New evidence for refitting and the more detailed analysis of the raw material are also presented above and further support and elucidate this interpretation. Extended microwear research has shown that other activities were extremely limited.

Some of the observations and interpretations forwarded can now be tested with the spatial layout of Rekem 7. The database used for the mapping consists of the refitted pieces augmented with all the unrefitted cores, tools and tooling waste. Its general layout coincides very well with the image of the complete scatter (compare for example Map 65 with Map 9).

With regard to the distribution of the various artefact types, at least two observations deserve further consideration.

Firstly, except for the two specimens in the centre of the scatter, cores are generally situated towards the edges. Five cores cluster remarkably on the southern limit of the concentration. Interestingly, exactly the same pattern has been observed at Rekem 11, the other locus at Rekem that specialised in the manufacture of LMP (section 6.2.5.3). While the discard (tossing) of cores away from the working area is commonly observed in ethnographic and archaeological cases of flint working, at Rekem a certain distinction may be drawn between such directed or guided discard (placement?) to a point on the edge of the scatter (as observed at Rekem 7 and Rekem 11) and the random centrifugal expulsion to outside the scatter (noticed for instance at Rekem 15).

Secondly, regarding the position of tools versus debitage waste, a certain concentration of the former may be distinguished in the E part of the scatter (in S6-7 E34). Conversely, unmodified flakes are quite numerous in the NW 'lobe' of Rekem 7. These patterns will be considered in more detail below.

A concentration of burnt pieces in the central part of the scatter suggests that, although evidence of constructed hearths is completely lacking at Rekem 7, there must have been a source of heat in this area. Whether or not this overlapped with the occupational time span, or with part of it, is unclear. If it did, a small open fire may have been lit on the S7-axis in E34.

Regarding the 6 tools bearing use-wear traces, one notices a clustering of the 3 elements used '*en percussion posée*' in the NE part of the scatter. These comprise 2 scrapers used on fresh/wet hide (Pl. 95: 17) and (perhaps) dry hide (Pl. 95: 14) and 1 large LMP employed as a butchering knife. One used projectile tip is also spatially associated with these 'domestic' tools while the 2 other used arrow tips, 1 still having resin glue attached, were found together along the SW edge of the concentration.

None of these used tools has been refitted, but considering their raw material (flint types 7/21 and 7/22), the 2 scrapers seem to have been manufactured at Rekem 7. Some processing of soft animal matter may also have occurred at this small spot. However, the most important observations are firstly that the artefacts at Rekem 7 were in any case hardly

[31] Caspar & De Bie 1996.

used (and consequently that the area was probably occupied for a limited time period) and secondly that we can still uncover a certain patterning.

Significant patterning was equally detected in the distribution of the various flint types. In view of the presumed short-term occupation and limited activity range, implying that cultural formation processes (maintenance, trampling, etc.) were limited, we may suppose that the original layout of the knapping spot(s) was more or less preserved at the time of abandonment. It would be nice to discover that post-depositional processes have not completely blurred this image.

Map 115 presents the plans of the flint types of the refitted artefacts. Although there are spatial outliers in all cases, the core areas of the different coarse grained flint varieties can clearly be differentiated: flint 7/21 in the NE part of the scatter, flint 7/22 in the SE part, and flint 7/23 in the NW 'lobe'. While the two former flint types are partly overlapping in the centre of Rekem 7, they are both definitely separated from 7/23. In fact, this separation explains the twofold structure of Rekem 7 already noticed in the preliminary description of the general distribution map (section 6.2.4.1).

Whereas it seems difficult to define the distribution limits of flint type 7/10 (probably because it comprises several nodules), many of its elements are certainly located in the central area. Finally, the undifferentiated coarse-grained flint artefacts (7/20) are not specifically associated with any of the defined varieties. They may belong to several of these or form different groups. In any case, the distribution of the different flint varieties at Rekem 7 suggests a clear partitioning of space, which may be read as 'different knapping spots'. The question remains as to how these are further related to the tools.

We have already remarked that tools and tooling waste products were mostly situated in the eastern part of the scatter (S6-7E34; *e.g.* Map 65). Map 116 shows that this concentration almost exclusively consists of LMP and Krukowski microburins. The only other formal tool types situated in this area are the two used scrapers mentioned earlier, two very oblique truncations that may also be associated with LMP production (Pl. 101: 5,6) and, quite interestingly, the two burins and refitted burin spall that were also joined within the LMP production sequences. Their close spatial association is remarkably similar to the situation of the two (equally unused) burins and burin spall encountered at Rekem 15 (section 6.2.1). However at Rekem 7, burin production is definitely associated with LMP manufacturing.

Except for some LMP outliers, the formal tools outside the dense cluster comprise truncated pieces, scrapers and a composite tool. The truncated pieces seem to be spatially co-related with the W sector of Rekem 7. They do not bear any traces of use, and some may be 'accidental' tools. The scrapers outside the scatter are widely dispersed and cannot strictly be affiliated to the main concentration. This also accounts for the single composite tool isolated to the SE, towards Rekem 13. Their flint types are also completely different from the ones observed at the main scatter.

A closer inspection of the distribution of the tools' flint types (Map 117) reveals that at least the members of flint group 7/21 neatly respect the area covered by the refitted debitage outlined above and illustrated on Map 115. It proves that blank production and tool manufacture (of LMP and burins) occurred on exactly the same spot, apparently in the same knapping position, and most likely in a continuous process. Tooling failures were not tossed away but dropped locally. A similar model may be forwarded for flint 7/10, while it is not contradicted by the few tools of flint type 7/22.

Even smaller areas may be contoured when only LMP are taken into consideration (Map 118). This map transparently reaffirms the exclusive association of LMP with the E part of Rekem 7, *i.e.* the side with the laminar technology. The outliers are either LMP in a completely different flint type (used projectiles), or the single 'finished' backed point (Pl. 72: 6) that may have experienced a 'special treatment' (*e.g.* selected but lost during transport?)[32].

Together, these patterns reveal a remarkable consistency. In our opinion, there are good reasons to believe that the spatial layout of Rekem 7 is still quite representative of the situation at 11350 BP. The enticing fine-grained picture of flint 7/21, could even persuade us tentatively to reconstitute the position of the craftsperson preparing a new set of weapon heads (Map 118).

6.2.4.4 Discussion

The fact that even a small lithic concentration, distributed over only a few square metres, can be 'dissected' to the degree presented here, once more confirms that Late Palaeolithic scatters in bioturbated sand deposits do not necessarily loose their interpretative potential for spatial analysis. Despite the undeniable post-depositional displacement attested by a notable vertical dispersion of the artefacts at Rekem 7, a detailed analysis of the horizontal distribution exposes spatial patterns that can still be related to systematic human behaviour.

Important new evidence (*e.g.* several new refits of backed pieces into reduction sequences) since our general study of LMP[33], reaffirms that Rekem 7 was indeed a highly specialised knapping spot narrowly focused on the fabrication of LMP. Whether the spot was (repeatedly) occupied by one person or whether more persons were involved in this fabrication process, is uncertain. The differentiated locations of the various flint types suggest at least two knapping positions (NE and SE). A third knapping spot, at the NW 'lobe', seems completely separated. Its spatial isolation is also reflected in the reduction method (thick flakes) and output (no tools). Apart from this 'deviating' performance, the homogeneity and 'exclusivity' of the action at Rekem 7 is striking.

[32] Remember that another 'finished' slender LMP made at Rekem 7 was discarded at Rekem 1.
[33] Caspar & De Bie 1996.

Because of this very specific status, Rekem 7 has provided an excellent example of the reconstruction of technical aspects of LMP production (section 5.2.4). Refits have also showed that small blades rather than bladelets were selected for LMP production (section 4.5.5). The size required for the LMP *supports* might also explain the fact that the cores at Rekem 7 had generally been abandoned once the core table had attained a length of about 5 cm. The table lengths of cores appropriate for blade production are, in dimensional order, 40, 42, 49, 50, 51, 51, 54, and 55 mm. Even if in some cases nice small blades could have been produced after platform renewal, they would have become too short to serve as blanks for LMP.

Apart from these technical observations regarding LMP proper, the association of LMP ~ burins has also been substantiated with new refitting evidence. Four burins could be combined with a series of LMP in the reduction of one flint type. Two unused burins were discarded on the knapping spot, while the two other specimens were exported, at least one of them having been intensively used, and eventually abandoned at Rekem 1. These observations call for an adjustment of the interpretation proposed for the large communal areas (*e.g.* regarding co-set 05c03) which stated that burins were made in (exclusive) series and were used and abandoned at the same spot. The evidence at Rekem 7 provides an example of a different strategy. At least two different tool types are manufactured in a single sequence and transported and used outside the production area. It seems that in this case, the generally domestic and 'stationary' burins were stirred by the highly mobile, 'flitting' LMP (projectiles). More generally, these observations once more reconfirm Rekem 7 as a real manufacturing place, where (mainly) backed pieces and (some) burins were made for use elsewhere.

This brings us to the crucial point of inter-locus relations. Several connections could be physically made with Rekem 1 (Map 27). Next to the two burins (and the burin spall), these include a finished backed point and two unmodified blades. Use-wear traces were found on a burin and a blade. With regard to the tools and the blade in flint types 7/21 and 7/10, the direction of transport from Rekem 7 to Rekem 1 seems to have been clearly established. This is not only because they refit in the reduction sequences at Rekem 7 (spatially established as primary refuse), but also because other artefacts of these flint types are very rare at Rekem 1. The latter is definitely not true for flint type 7/22. In fact, this type is very well represented at Rekem 1 and seems to have been also exploited there, since one of the biggest locally refitted co-sets (01c01) is precisely made from this material. Interestingly, the co-set includes a broken blade descended from Rekem 7 which suggests that at least some material also moved from Rekem 1 to Rekem 7.

Such bi-directional connections can be explained in various ways and provide no absolute proof of contemporaneous occupation. Next to a model of 'exchange' or interaction, one could imagine different scenarios of artefact recycling ('scavenging') at a former knapping spot and the simultaneous dumping of material there. Any such scenario, however, necessarily implies a return to the place whence the actor initially came. In this case, however, it seems unlikely that the artefacts abandoned at Rekem 7 were scavenged by 'occupants' of Rekem 1. Specifically, and with regard to the finished backed point, this interpretation would imply that either the original toolmaker had neglected this nicely finished implement or that the Rekem 1 person had scavenged a blade in order to make a tool of exactly the same design as those that had been initially made from the output of this reduction sequence. The same sequence contains a similar but broken LMP that had been abandoned at Rekem 7. Both assumptions seem rather unlikely. In our opinion, the most likely interpretation, at least for the tools, seems to be that they had indeed been manufactured at Rekem 7, exported and used elsewhere (outside the camp in case of the backed point) and were eventually dumped at Rekem 1. This would also explain the rather intense use-wear on the burin and on one unmodified blade. More arguments in favour of regarding Rekem 1 at least a partial dump-spot are provided below.

Most importantly, these considerations immediately imply that Rekem 7 cannot be regarded as a small isolated transit camp of some hunters on the move. The player(s) concerned clearly interacted with other parts of the settlement space. In other words, there is a strong indication that the small isolated scatter of Rekem 7 should not be disconnected from the larger settlement. The implications of these conclusions will be further discussed in section 6.4.1.

6.2.5 Rekem 11

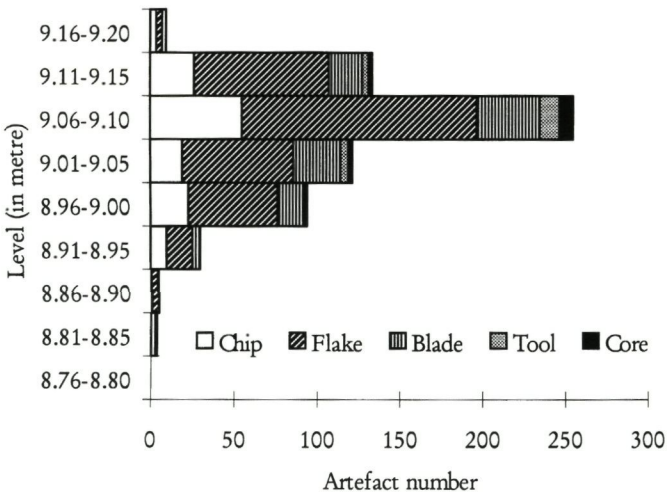
6.2.5.1 Field observations and vertical distribution

Rekem 11 was discovered in 1985 in the vicinity of Roman period structures which had certainly destroyed part of the *Federmesser* level in the S sector but which otherwise mainly avoided the main concentration. At this locus, recording method B was adopted for the first time (*i.e.* mapping to scale of individual artefacts; see chapter 2).

A continuous, large surface of some 175 sq m was systematically investigated using this procedure and, except for elements belonging to the small scatter, denominated 'Rekem 13', in the NW part of this trench, all artefacts were inventoried as 'Rekem 11'. However, several sectors may be distinguished. The principal cluster of artefacts occurred in the SE sector appearing as a well-circumscribed concentration of some 6 sq m (Map 12). The large, carefully excavated area around this main scatter presented a low density distribution of artefacts with an important number of flint tools and tool waste in the E and some large sandstone blocks in the N part.

The vertical distribution at Rekem 11 was again rather limited with, in the area of the dense flint scatter (i.e. 20-26N, 104-110E), a general dispersion somewhere between 9.16 and 8.91m, but with most artefacts (including all the cores) occurring at a level of 9.11-9.05m (fig. 92).

92 *Rekem 11. Vertical distribution of artefacts from squares N20-26 E104-110*



6.2.5.2 *Rocks*

The rocks from north of the main scatter are generally unmodified except for one heavy-duty tool which had been broken in two. None of these shows the influence of fire. The rocks found inside the main concentration consist of a few occasionally refitting tiny scraps and, on the edge of the scatter, one larger fragment with slight traces of hammering (Map 21). Finally, some rocks occurred in the SW corner of the excavated area, close to the edge of Rekem 10. One slab could be refitted here. In all, some 5kg of rocks have been collected at Rekem 11 (Table 7) but less than 1kg was actually associated with the main flint scatter. One tiny fragment of red ochre was situated in the S part of that concentration, and a larger slab in the N part.

6.2.5.3 *Flint production and other activities*

The flint assemblage at Rekem 11 contains 16 cores, 559 blades and flakes (including 27 core rejuvenation products and 18 edge-damaged pieces), 1573 chips, 2 lumps, 62 tools and 45 tooling waste products (Table 13). 20% of the artefacts could be refitted (Table 26) in 8 co-sets and 25 refit sets (Table 25). Except for 2 specimens (of which 1 was isolated outside the main scatter), all the cores are included in these refits (Table 29; Map 88). The tools are dominated by LMP (17 slender and 12 large elements) but also include 20 burins, 7 scrapers, 3 truncated tools, 1 bec, 1 composite tool, and 1 randomly retouched piece. Finally, 9 Krukowski microburins and 36 burin spalls have been recovered (Table 34). These items were generally well preserved for microwear analysis and a considerable number appeared to have been used on bone/antler (17) and on dry hide (2). The composite tool was used on both. Two used projectile points were found amongst the slender LMP, and another 3 large LMP served for cutting carcasses. The large majority of LMP, however, were clearly accidentally broken or discarded in an unfinished state.

At the time of writing, the flint assemblage of Rekem 11 has not yet been subjected to a form of spatial analysis as elaborate as that employed at Rekem 7 or Rekem 15. However, there is no doubt that this locus also presents a fine-grained spatial resolution.

Within the main flint scatter, chips are densely concentrated in the central part (fig. 93) whereas the cores are systematically rejected along the edges, essentially on the SE corner (a remarkable cluster of 8 cores[34]!) and on the NW side. Debitage products are also densely concentrated in the central part although some areas (knapping positions?) remained remarkably empty. The spatial layout of most co-sets (11c01, 11c02, 11c04, 11c06, 11c07, 11c08) is very similar (Map 80-81, 83-86) but some refit sets on the W edge seem to expose a more W orientation (Map 87). The knapping 'style' of all these co-sets is quite uniform and displays a mediocre level of flint knapping quality. Clearly, more detailed analysis (esp. of flint types) might possibly shed further light on the number of knapping positions (and artisans?). Finally, despite the absence of evident hearth features, it cannot be proven that Rekem 11 did not contain a fireplace. This is indeed suggested by the high number of burnt flint artefacts. The increasing proportion of burnt chips in the SW corner, at N22 E106 (fig. 94) may possibly point to its actual position.

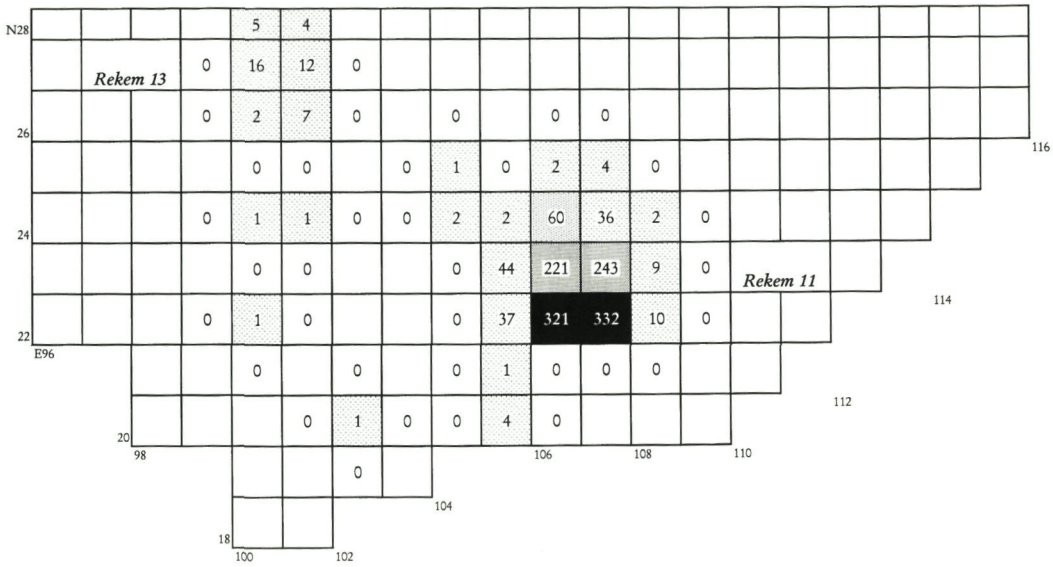
The characteristics of the numerous slender and large LMP and their waste products show the main flint scatter at Rekem 11 to be one of the specialised locations for primary LMP manufacture[35]. However, a few additional activities also occurred here as is indicated by a range of other tools (10 burins and 26 burin spalls, 1 composite tool, 1 bec, and 1 randomly retouched piece). Most of these pieces were made and 'consumed' locally and those preserving use-wear all served on bone or antler (see for details section 6.3). Whether or not this activity was also linked with the preparing of procurement activities (*e.g.* manufacture of harpoons?) remains unfortunately equivocal.

To the West of this production workshop, an empty oval-shaped space of some 6 to 8 sq m is de-

[34] An almost identical layout has been observed in the scatter of Rekem 14, some 150 m to the east of Rekem 11, and yet not treated in the present spatial analysis. A concentration of cores on the S edge of the scatter was also noticed at Rekem 7 (see above, section 6.2.4.3.).

[35] Caspar & De Bie 1996; see section 6.3.4.1.

93 *Rekem 11. Distribution of flint chips by 1 m².*



limited by 6 of the 7 scrapers found at Rekem 11. One of them was used on dry hide, while the others were burnt (1) or seemingly abandoned after a final resharpening attempt (5). The layout of this configuration, and its isolated occurrence, are all very reminiscent of other dry hide working spots observed next to the main scatters at Rekem 5 and Rekem 6 (see section 6.3.6). The fact that the burnt elements were found at the location of the presumed fireplace (N22 E106), suggests that this scraping activity took place while or before the hearth was active.

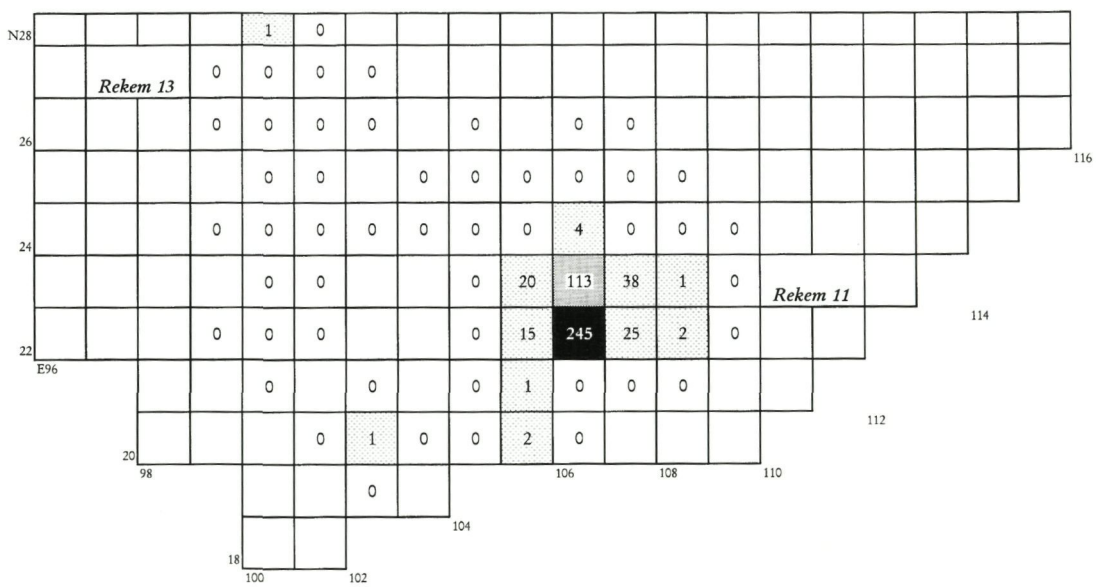
Finally, the extreme W corner of the Rekem 11 trench produced 10 burins and 10 burin spalls that can be associated with another 3 burins found in the E end of the Rekem 10 trench. The contents and layout of this intermediate zone are also discussed in detail in section 6.3.7.3. In the context of Rekem, such an isolated activity area for bone and antler work is rather exceptional (but possibly paralleled at Rekem 16).

To summarise, various (outside) activity areas can be identified in the large area of Rekem 11. Their mutual relationship cannot be precisely established, but the spatial 'organisation' of these areas seems very distinctive and all were situated along a line stretching from the dwelling of Rekem 10 (see below) up to the production spot of Rekem 11. Whether or not they were indeed all linked with the habitation of Rekem 10, bordering this area to the West, is possible but could not be ascertained[36].

Having demonstrated that high resolution patterns of past human behaviour can still be detected

[36] Except for a refit connecting flakes from the intermediate area with a core from Rekem 11, no other connections could be realised between the various activity areas. Unfortunately, the possible relation with the adjacent zone S of Rekem 11 and E of Rekem 10 is unknown, as this area was considerably disturbed by posterior occupation, and further E also by the substructure of a small contemporary road (Map 1).

94 *Rekem 11. Distribution of burnt flint chips by 1 m².*



in the small loci which reflect only a limited range of activities, we can now investigate to what degree such a patterning has been preserved in the larger concentrations having a more palimpsest-like nature.

6.2.6 Rekem 10

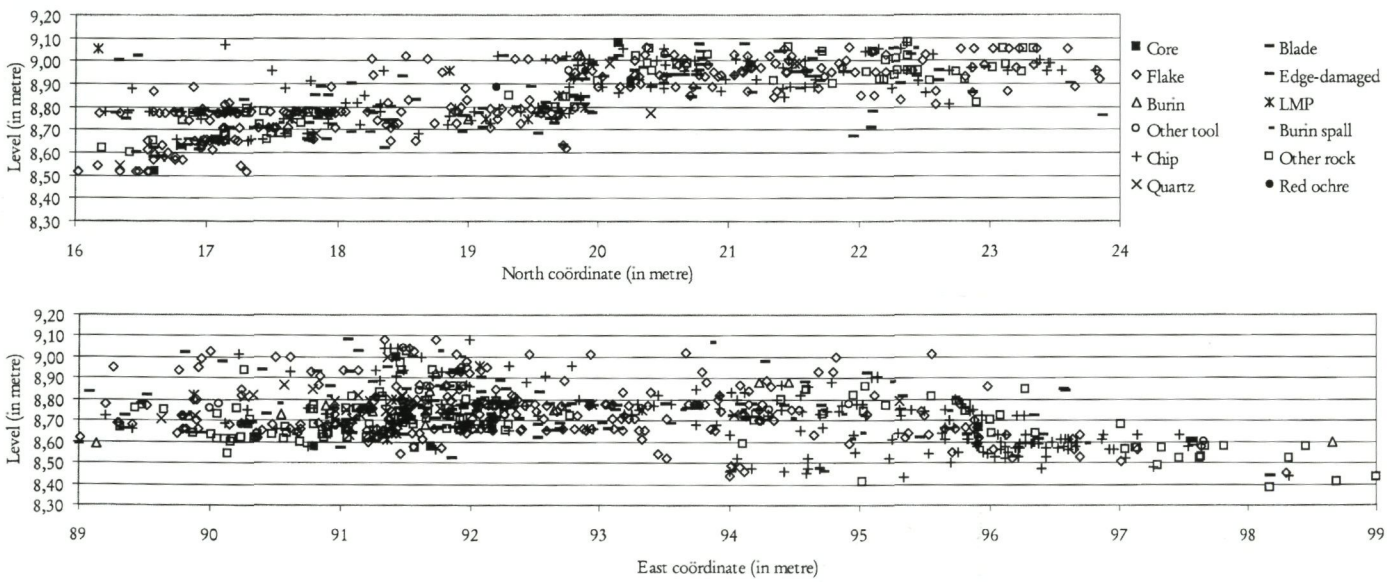
6.2.6.1 Field observations and vertical distribution

Rekem 10 was excavated in 1985 in a sector where the remains of later (proto-)historic occupation were very scarce. In the extreme S limit of the trench, a late medieval ditch was recorded, but its depth did not fully reach into the *Federmesser* levels. Horizontally, it was also situated outside the find scatter[37] (Map 20). In all, this sector appeared largely intact before excavation. A total of 138 sq m were investigated using recording method A (see chapter 2).

The inventory at Rekem 10 includes about 5kg flint, 2kg quartz, nearly 50kg of other lithic remains, and a few grams of red ochre (Table 7). The majority of the rocks are burnt (62%) and extremely fragmented (Fragmentation Index = 3.1; Table 10). Their abundance, as compared with the rather modest presence of flint material, is immediately apparent. It was noted during the excavation that these remains presented a high degree of spatial patterning and had a remarkable circular outline.

Also noted during the excavation was the increasing depth of artefacts occurring further S(E). This field observation is indeed reflected on the vertical plots (fig. 95) where all the artefacts occurring horizontally in two bands of 2m wide were plotted along the N-axis and along the E-axis. The former plot manifests a S-oriented slope with an overall vertical distribution of between 9.10m and 8.90m in the N part, and between 8.80m and 8.60m in the S (with outliers till 8.50m). On the W-E plot, the gradient is less steep but a depth of between 8.60m and 8.40m is reached on the E edge. There are no immediate differences among the various raw materials or artefact types. Unfortunately, no stratigraphic profile has been recorded in this area. On the field registration sheets, all artefacts were reported to have occurred in the same type of white-yellow sands but the specific interpretation of the sediment seems heavily excavator-dependent. What exactly this slope represents is therefore difficult to establish. The possibility that the occupation zone here was situated on the SE edge of the Late Pleistocene sand ridge, a location that would in fact have provided a good view over the Meuse valley in the SE, cannot be excluded.

95 *Rekem 10. Vertical distribution of various artefact types along N-axis (for artefacts occuring in band between E92 and E94), and along E-axis (for artefacts occuring in band between N17 and N19).*



[37] It is possible, however, that an obliquely backed point (Pl. 73: 6), found in this sector (Map 124), intruded into the assemblage because of this disturbance. It was found on a high position, made in a completely deviating flint type, and did not at all fit the pattern of projectile distribution observed at Rekem 10. Its association with the *Federmesser* assemblage can therefore be questioned. At Rekem, this piece could be the exception to the rule that the *Federmesser* level was not contaminated by Mesolithic elements. The only other microlith-type point (Pl. 72: 7) may be clearly interpreted as a failed (?) product of the LMP manufacturing process at Rekem 7. It occurred fully within this scatter and was made of the same flint type as the other 'mishaps'.

6.2.6.2 *Distribution of rocks: fire places and dwelling structure*

Of the total excavated area of 138 sq m, some 45 to 50 sq m are densely littered with lithic remains (Map 10). The general distribution pattern is entirely different from what we know of the other large surface sites that have also produced rich rock remains (Rekem 5 and Rekem 6). The overall outlook of Rekem 10 displays a much more apparent organisation, though again no unequivocal structures were preserved. From a first visual impression, a semicircular zone appears, stretching from N16 to N22 and from E88 to E95. Almost all the larger blocks occupy an eccentric position, occurring at the outer contour lines of this semicircular pattern.

Conversely, the majority of small, broken rocks are clearly concentrated in squares N19-20E91 which are more or less at the centre of the semicircular space. The bulk of this small debris consists of quartz fragments. This central accumulation of fine debris is almost completely surrounded by a more or less rock-free belt measuring 1.0m to 1.5m wide. Although the thorough conjoining of the quartz elements has not been envisaged, close inspection and several refits show that this small quartz debris, together with the few larger fragments, originally belonged to 4 or 5 cobbles at the most. Their breakages are obviously due to heating, probably while being used as pot boilers. The many short distance refits involving some of these quartz fragments and their well defined cluster in the centre of the locus may indicate the point of use. Some of the fragments have been removed from the site with a clear preferential direction to the S border of the general distribution area. It is important to note, however, that this centrifugal dispersion does not transgress the limits set by the dispersion of the large quartzite blocks.

The map reproducing all the rock refit-lines (Map 20) does not reveal a predominant direction, nor are they fully radiating from the centre to all directions, as noted at other structures (*e.g.* Rekem 5 West). Most of the refits are middle to long distance and often cross the entire area. Rocks situated outside the circular zone on the N and W side are also connected with elements inside the area. The quasi-absence of true short distance refits suggests rare *in loco* breaks on any part of the site (again in contrast with Rekem 5 and Rekem 6; sections 6.2.7 and 6.2.8). It seems that intensive maintenance and clearing occurred here, as if the more encumbrant remains, which for a great deal played a primary role in a fire-related function, were removed to the edge of the inhabited area. The eccentric position is also characteristic for all the unburned, and thus larger, blocks. This means that some areas had to be kept clear of them. We therefore think that the fairly well defined outer semicircular limit marked by the distribution of these rocks does reflect the inner wall of a construction. The area immediately to the E of this semicircular area, and which is largely devoid of any such encumbrances, may effectively represent the actual living area. This supposed dwelling would then have been of more or less circular outline with a diameter of some 6m. We do not think that these rock remains had a primarily structural function but their location was presumably guided by the presence of a construction of which no direct traces are left. Openings (for outside dumping) were possibly present at the points where some rocks are situated beyond the circular outline, on the N and W side. The linear arrangement of blocks to the E also occurs outside this circular structure, but they are generally refitted to fragments in the NE sector. Their linear arrangement may again reveal a wall effect, possibly related to the (main) entrance of the presumed dwelling structure, which would then have been situated in the SE corner.

Regarding the blocks situated still further east, two groups may be discerned. The small cluster at the extreme E border of the trench, in N16E 99, consists of a pile of unburned, unmodified blocks and may perhaps best be interpreted as a reserve kept in the periphery of the locus. The rocks in the cluster next to it, at N16E96, are all burnt and some are connected in local refits suggesting that a hearth may have existed here. A few blocks were also modified as heavy-duty tools, and one refits with its flakes that were found slightly more to the NW. There are no refits to the western area of Rekem 10. If this cluster in N16E96 does indeed represent the remains of a hearth (presumably an outside hearth), it is certainly isolated from the burnt rocks spread around in the semicircular space and which might all have belonged to an internal hearth. The precise location and morphology of this inside hearth has become completely obliterated. On the other hand, it cannot be excluded that the concentration of small quartz fragments in the centre of the habitation reveals at least one possible position.

Finally, refitting has shown that at least 4 of the blocks used at Rekem 10 were collected from Rekem 6 (N=3) and Rekem 5 (N=1). A connection with Rekem 13 could also be established, but the direction of recycling is unclear (Map 25).

6.2.6.3 *Flint from the dwelling*

Contrasting with the wealth of rocks, the flint inventory at Rekem 10 is relatively limited. The assemblage contains 14 cores, 936 blades and flakes (including 39 core rejuvenation products and 30 edge-damaged pieces), 682 chips, 3 lumps, 122 tools and 45 tool waste products (Table 13). With a total of 1802 items, there are thus fewer flint artefacts than at the small debitage scatters of Rekem 7 and Rekem 11. On the other hand, the number of tools (122) is twice as high. Two categories are dominant, burins (N=47), and LMP (40 slender and but 1 large element). In addition, 7 truncated tools, 6 scrapers, 6 becs, 2 borers, 2 reamers, 4 composite tools, and 7 randomly retouched pieces have been recorded, as well as 44 burin spalls and 1 Krukowski microburin (Table 32).

21% of the flint artefacts could be refitted (Table 26) but mostly in only limited sequences (5 co-sets and 63 refit sets; Table 25). Still, the fact that 11 out of 14 cores could be included in the refits suggests that much of the knapping was performed locally (Table 29; Map 79). In fact, flint type uniformity may have impeded the attainment of a higher refitting rate.

The condition of the flint material submitted for microwear determination appeared exceptionally poor at Rekem 10. Not less than 63% of the analysed artefacts were affected by some form of mechanical alteration (Table 1). On the pieces that could be diagnosed, use-wear analysis revealed the working of bone or antler (16 IUZ, on burins and spalls, becs, and unmodified blanks), dry hide (14 IUZ, again mostly on burins but also on 4 scrapers and on a composite tool), supple (dry) hide (on 1 scraper), hard unspecified matter (1 bec) and carcass (the single large LMP). Three implements (1 burin and 2 becs) presumably served as firelighters, and 26 of the 40 slender LMP could be diagnosed as used missiles (2 as barbs, the others as projectile heads).

Before considering these activities in more detail, we would first like to investigate whether evidence can be found in the spatial layout of the flint material that supports the presence of a dwelling as has been inferred from the distribution of rocks. Next to the patterning related to primary flint knapping (see Rekem 15), it may be assumed that artefacts manufactured and manipulated inside a dwelling were subjected to a whole range of additional secondary formation processes. A few hypotheses may be formulated in this regard and tested against observations at Rekem 10:

1) If produced and/or 'consumed' inside the dwelling, the flint artefacts should evidently respect the boundaries (walls) of the structure (unless there are outdoor dumps).

2) As cleaning is more likely to be rigorous in intensely used domestic areas such as habitation interiors and areas immediately surrounding domestic hearths[38] it can be expected that artefacts introduced in the earlier stages of habitation would have ended up widely dispersed.

3) The clearing of domestic areas will probably affect large (obstructive) items more than small artefacts. The former may be tossed away from the central area and eventually display a centrifugal effect.

4) Finally, it has often been noted that the intensity of trampling and other (human) movements at intensively inhabited areas can significantly affect the vertical displacement of artefacts[39]. This can be the same for paths and doorways. In addition, it can be assumed that dry floors inside habitations possess a higher grade of penetrability than moist outside soils.

The first hypothesis can be easily verified by comparing the distribution of the flint material (Map 11) with the map of the rocks indicating the presumed dwelling structure (Map 10). This confrontation reveals that the edges of the hypothetical dwelling are indeed respected by the flint scatter, except in places where the rocks already suggested an opening[40] or at least the possible presence of outside dumps (*i.e.* in the N and in the E). The synthetic map of the flint refits (Map 79) fully supports this observation and shows a remarkably directed orientation of refit-lines 'passing through the N doorway' – a pattern never before observed at any of the knapping spots described above. This map also shows that occasional outliers outside the SW edge of the dwelling are not included in the refits. On the other hand, several artefacts recorded on the SE part of the scatter, adjacent to the outside hearth, are connected with elements from inside the dwelling[41]. It should be emphasised that the objects in this area generally remain S of the linear boundary, which is presumed to have been connected with the main entrance.

The second hypothesis, namely the greater horizontal dispersal of the artefacts at Rekem 10 as compared with the dispersal at short-term occupied knapping spots, can also be easily assessed with the refit maps. When we compare, for instance, the distribution of artefacts refitted in co-sets 10c02, 10c03, 10c06, etc. (Map 74, 75, 77) with those from any of the co-sets in the knapping spots (*e.g.* 11c01, 11c04, 16c02, 16c04, etc.; Map 80, 83, 107, 109; all maps have the same scale!), the distinction is immediately perceptible. For most of the refitted sequences at Rekem 10, it has become impossible to determine the original position of the knapper. As was noted in chapter 4, this is especially so in the high-quality reduction sequences (10c02, 10c06; Pl. 50, Pl. 51), produced by experienced knapper(s), which generated a rich output of blades and bladelets, *i.e.* artefacts that may have been repeatedly picked up and relocated inside the habitation. Only for the sequences with (partly) more robust output, possibly knapped by less skilled artisan(s), a possible point of reduction may still be perceived, for example in the SE corner of the dwelling, near the entrance for co-set 10c01 (Map 73). The presence of chips in this area could support this identification (fig. 96). Interestingly, this S border of the dwelling also contains an accumulation of 6 cores. According to the general distribution of chips, however, most of the knapping must have taken place in the centre of the dwelling.

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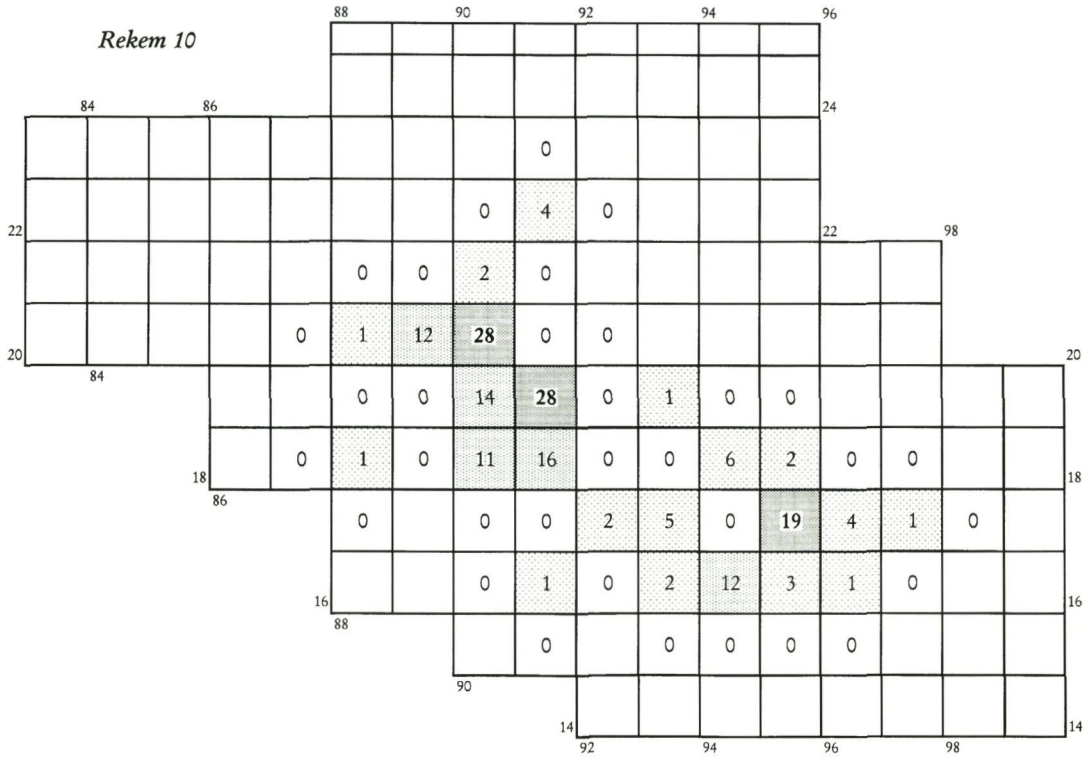
38 Keeley 1991, 258.

39 Yellen 1977; Stevenson 1991.

40 Ethno-archaeological observations have shown that '*door locations often vary as a result of wind directions* [and that] *multiple doors sometimes were used simultaneously and sometimes not*' (Janes 1989, 852).

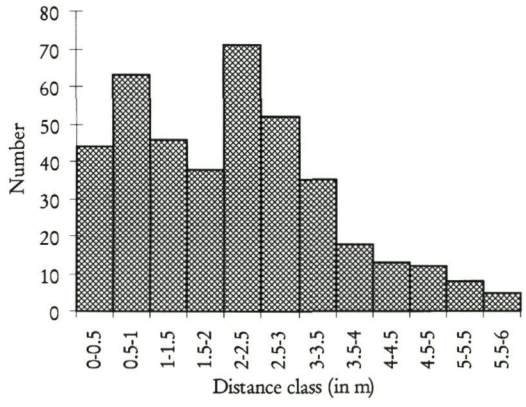
41 It is important to note that the number of points figuring on Map 11 in this SE sector (N16-17 E94-96) is certainly exaggerated compared with other sectors at Rekem 10. In fact, since sieving in this sector was impeded by localised but intense gleyification, chips were also plotted individually here. Since they have not yet been considered in conjoining attempts, there is also a very low rate of refitting artefacts in this sector. However, a first glimpse on this material suggests that it includes a considerable amount of retouch waste, obviously reflecting a tool manufacturing spot. Burin spalls encountered in this same sector, and refitting with burins inside the dwelling subscribe this interpretation (see section 6.3.7.3).

96 *Rekem 10. Distribution of flint chips collected from sieve, by 1 m².*



This brings us to the third hypothesis (centrifugal effect of heavier items) which can perhaps best be tested with a variant of the ring method as conceived by Stapert[42]. This method is advocated as an appropriate procedure for analysing the concentrations of finds around a central hearth. The distances between the positions of the artefacts and the centre of the hearth are measured and artefact frequencies counted in classes (rings) of, for example, 0.5m wide. Stapert originally applied this method to examine whether or not the hearth was situated within a tent. If so, a bimodal distribution would result from the barrier effect. The tent (or hut) wall would function as an obstruction where, as a consequence of the centrifugal effect, refuse that had been tossed away accumulated, resulting in a second peak (a toss-zone) in the diagram (the first peak representing the drop-zone near the hearth). As a consequence of the feature-oriented character of this method, the choice of the hearth (centre) determines all further analysis. As shown at Rekem, this is not always evident at Late Palaeolithic sites. At Rekem 10, the only indication of a possible hearth in the centre of the dwelling is supplied by the small quartz fragments that probably lingered in the sand matrix when the larger blocks were removed. If their location corresponds with the place of the hearth, then its centre may be situated at N20 E91.8. When applying the ring method from this centre, a bimodal distribution is indeed generated. This is very evident for the rocks and exhibits a first peak at 0.5m-1.0m and a second peak at 2.0m-2.5m (fig. 97). When quartzes on the one hand and sandstones and quartzites on the other are considered separately (fig. 98), the former appear to present a unimodal distribution (*i.e.* in and near the hearth) whereas the bimodality of the latter is further emphasised. Fig. 98 also shows a bimodality for the flint artefacts, though with a first peak occurring further away from the hearth centre (at 1.0m-1.5m), while the second peak (the barrier effect) remains at 2.0m-2.5m. The slow decline behind this second peak, and the increase at 5.0m-5.5m can be ascribed to the numerous artefacts outside the main entrance and near to the outside hearth. When a diagram is generated for the various artefact types, the pattern becomes markedly peaked for some categories (fig. 99). The bimodality seems essentially established by the flakes and (slightly) by the blades. The

97 *Rekem 10. Ring method for non-flint rocks. Artefact numbers in distance classes of 50 cm from centre N20E91.8.*



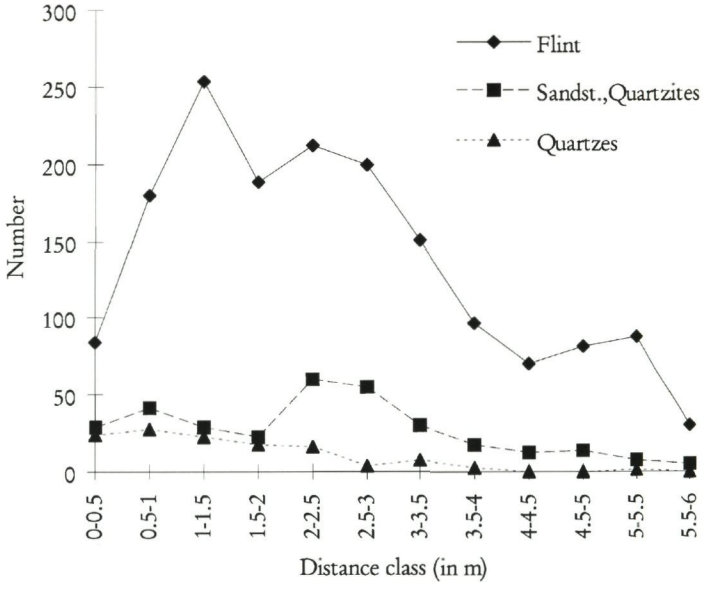
42 Stapert 1992.

cores show a single peak at 2.5m-3.0m, overlapping with the second peak of core preparation products and chips. The latter have two more peaks, of which the last one evidently corresponds with the tool production area near the outside hearth. The tools, finally, show a unimodal pattern. Only the backed pieces (LMP) display multi-modality (fig. 100) but the artefact count is far too low in this case for a valid interpretation. Further discussion of the tool distribution at Rekem 10 follows below. In all, the diagrams presented here only seem to confirm what had been observed earlier from a detailed reading of the floor plans.

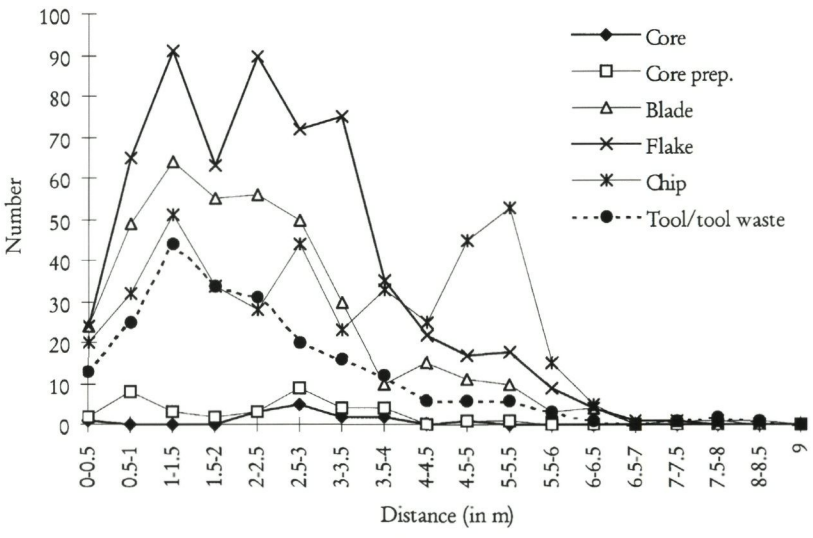
Regarding the fourth hypothesis, we can refer to the diagrams of the vertical distribution presented above (fig. 95). At first sight, the W-E plot seems to establish a considerable vertical displacement (from 9.05m to 8.55m) for the artefacts occurring inside the dwelling (i.e. from E89-E94). However, this effect is partly the result of the slope occurring in the 2m band between 17N and 19N. The S-N profile shows that most artefacts generally display a vertical spread of 20-25 cm, a depth that hardly exceeds the patterns observed at the short-term knapping spots. It seems that small-scale biological activity after site abandonment largely palliated possible inter-locus differences of vertical distribution. In contrast with the 3 other predictions, the fourth hypothesis can therefore not be validated.

Although further 'proof' of the presence of a dwelling structure at Rekem 10 is presumably not required, some additional arguments provide extra support for this interpretation. The importance of edge-damaged pieces without any use-wear, compared with their presence at primary knapping spots, for instance, presumably reflects the fact that trampled lithics are characterised by certain micro-flake types[43]. A most intriguing observation at Rekem 10, finally, is the high degree of mechanical alteration on microscopically analysed pieces. The appearance of this alteration fully resembles microwear polish caused by contact with hard non-woody plants or wood but is randomly distributed on the artefacts' topography. It seems quite conceivable that this phenomenon is not at all caused by post-depositional processes, which might have been expected to have had an effect on the other concentrations as well, but is fully linked with the systemic context. Many ethno-archaeological studies describe the presence of organic floors inside dwellings (such as willow floors for the Inuit[44], and '*a mat of dead spruce needles and dead spruce boughs devoid of needles, along with a mixture of wild grass and fireweed*' for the Dene[45]). If a similar floor cover was originally present at Rekem 10, it is possible that intensive trampling eventually generated random traces of 'mechanical alteration' on the flint material. An experimental program to test this hypothesis is presently in preparation. If confirmation can be reached, the results would of course be invaluable for the identification of dwelling structures at sites where no clear structures are preserved.

98 *Rekem 10. Ring method for various types of lithic material. Artefact numbers in distance classes of 50 cm from centre N20E91.8.*



99 *Rekem 10. Ring method for various categories of flint artefacts. Artefact numbers in distance classes of 50 cm from centre N20E91.8.*

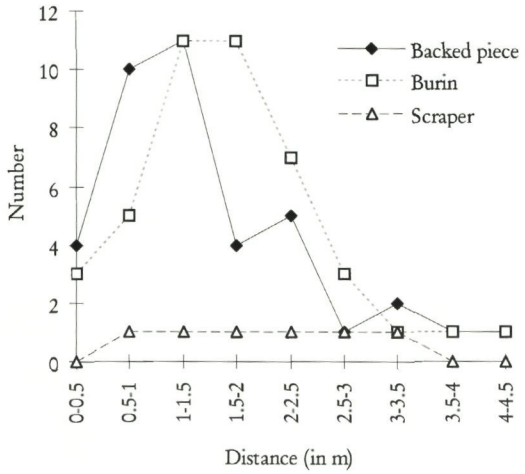


6.2.6.4 *Activities in and around the dwelling*

As stipulated above and discussed in more detail in section 6.3, processing activities in the dwelling essentially concerned the working of bone or antler, and of dry hide. The hide – possibly in a much advanced stage of transformation – was worked in diverse ways (scraping, graving, cutting). This variability might be associated with softening activities (of leather?) and/or with the fabrication or maintenance of clothes or other leatherware. Such a use might also explain why 6 burins and a composite tool also served as cutting, grooving and scraping tools

43 Keeley 1980, 35.
44 Binford 1978.
45 Janes 1989, 131.

100 *Rekem 10. Ring method for backed pieces (LMP), burins, and scrapers. Artefact numbers in distance classes of 50 cm from centre N20E91.8.*



on this material. However, burins, becs, and blanks were also used in bone or antler work (scraping, sawing, graving, and piercing). It is possible, therefore, that this was in turn related to the manufacturing of hide-work requisites (*e.g.* needles) or clothing attributes. Refitting with burin spalls located outside, near the main entrance (Map 78), indicates that part of the activity (or at least the resharpening of the burins) also occurred in front of the dwelling.

In addition to these domestic activities, Rekem 10 was also one of the loci where broken projectile points were removed from their shaft and tossed to the edges (for point tips and large fragments) or dropped near the hearth (for small base fragments)[46]. Finally the presence of (presumed) firelighters in this dwelling may be emphasised. In all, the activity pattern inside the dwelling at Rekem 10 clearly deviates from the handling performed outside and which can be observed at the other loci.

6.2.7 Rekem 5

6.2.7.1 Field observations and general description

Discovered during the first few days of the primary field-campaign on the *Federmesser* site, in August 1984, Rekem 5 was to become, in quantitative terms, the largest concentration of flint material. Although the locus was found during excavations of mainly Roman period remains, there are no signs of disturbance in the *Federmesser* levels from later Protohistoric or Roman occupation.

Following the general field strategy of the first campaign (recording method A, see chapter 2), the three co-ordinates of every artefact were recorded by an excavator working in a square of 4 sq m. The exhumed sand was additionally sieved and the chips were bagged by 1 sq m. The total excavated area of 148 sq m produced a concentration of artefacts encompassing about 50-60 sq m.

From an initial over-view of the general distribution maps of all the lithic material from Rekem 5 (Map 5 & 6), one can roughly discern two separate areas. An eastern area with a dense circular scatter which, starting from a dense concentration in the centre (square N15 E8) and represented by 5 clustered cores, slowly decreases in density towards the periphery. This area contains by far the majority of the flint inventory. Separated by an area almost devoid of lithic material, a less dense scatter is situated in the western part of Rekem 5. The sandstone concentration in N18 E1 appears to be the centre of this western scatter, while the rest of the lithic material is spread more thinly in the surrounding area. We will further refer to both areas as Rekem 5 East and Rekem 5 West.

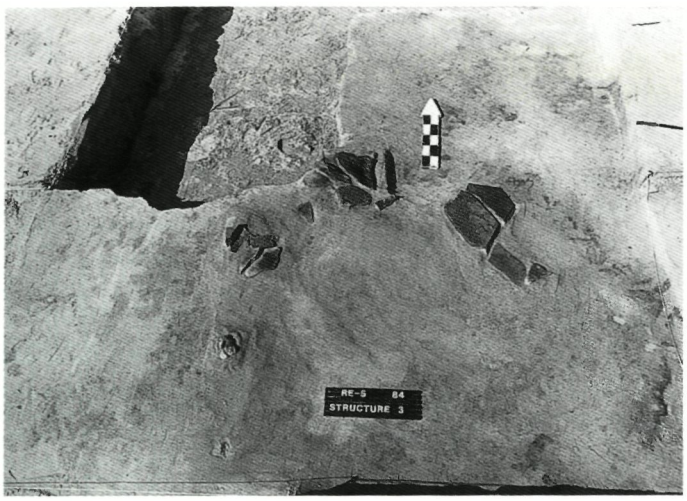
In all, 16.4kg of flint material, 3.0kg of quartz and 56.7kg of other mineral remains were found, as well as some 80g of red ochre (Table 7). 76% of the rocks according to their weight, and 482 (9%) of the 5662 pieces of flint were burnt. During the excavation, some of the (burnt) sandstones appeared to form distinct clusters which were labelled 'structure 1' to 'structure 5' (*e.g.* fig. 101-102) even although their significance was not immediately apparent. In fact, during the fieldwork, no evident structure was recognised. It was obvious, however, that for an advanced spatial analysis, integrating results of refitting and microwear, this concentration seemed very promising.

6.2.7.2 Vertical distribution

The find level at Rekem 5 ranges from 9.27m to 8.48m, i.e. a maximum spread of almost 80 cm, which is definitely more than at most other loci. However, about 70% of the artefacts were situated between 9.10 and 8.86 cm (fig. 103) without any obvious sorting by artefact type having taken place. Since the total range is also covered by single refitted co-sets (*e.g.* 05c05, fig. 104) there are no valid arguments for a distinction of artefact 'layers' in this assemblage. Nevertheless, some differences in the vertical spreading between individual co-sets do occur (fig. 104). Part of this variation may have been caused by micro-topographical variation in the occupation zone (*e.g.* co-sets like 05c16 and 05c17, situated in the W sector of Rekem 5 West, appear somewhat higher than those located further E). Otherwise, it remains a possibility that systemic human activity is responsible for another part of the variability. It is apparent, for instance, that the vertical spread of co-sets occurring outside the main concentration (*e.g.* 05c02, 05c04, 05c15, 05c30, 05c32; Map 43, Map 45, Map 52 & Map 56) is generally less advanced than the dispersal evident amongst those inside the main occupation zone. Co-sets from the E sector of Rekem 5 East in particular, and specifi-

[46] Caspar & De Bie 1996; see section 6.3.4.2.

101 *Rekem 5 East. 'Structure 3' (sandstone blocks, quartzites, quartz).*



102 *Rekem 5 West. 'Structure 4' (sandstone blocks, quartzite).*

cally those from around square N15E9, display a substantial vertical scatter (*e.g.* 05c05, 05c06, 05c12; fig. 104; Map 45, Map 46 & Map 51). It is possible that a shallow depression (small pit), in the region of 50cm deep, may have temporarily existed in this area as is suggested on fig. 105. Its presence seems to have affected specific co-sets (05c05, 05c06) since the vertical distribution of artefacts refitted in other conjoinments discarded in this same area (05c03, 05c11) does not diverge from the general level of the occupation zone. This implies a (partial) infilling of the depression during the time of occupation. It seems therefore unlikely that this feature resulted from a post-occupational natural event (*e.g.* tree-fall pit). Nevertheless, we shall have to examine to what degree such vertical displacement at this dense palimpsest may have obliterated horizontal patterning.

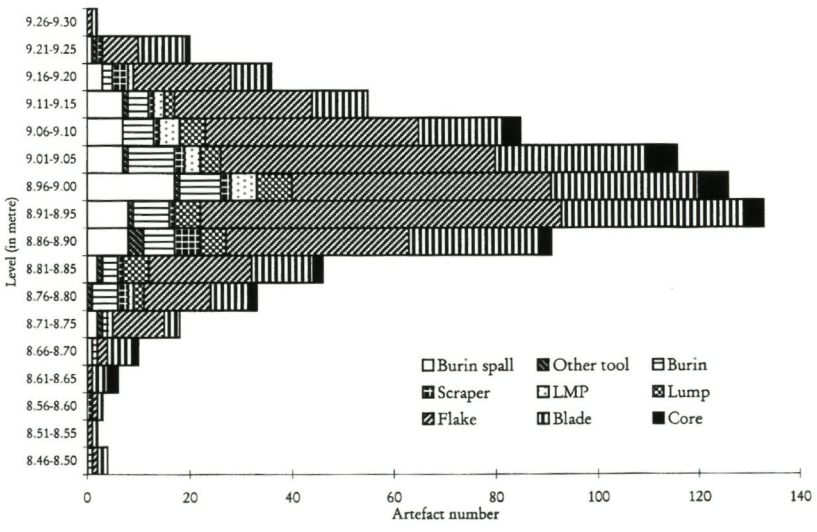
6.2.7.3 Distribution of rocks: indices of 'site architecture'

Rekem 5 West

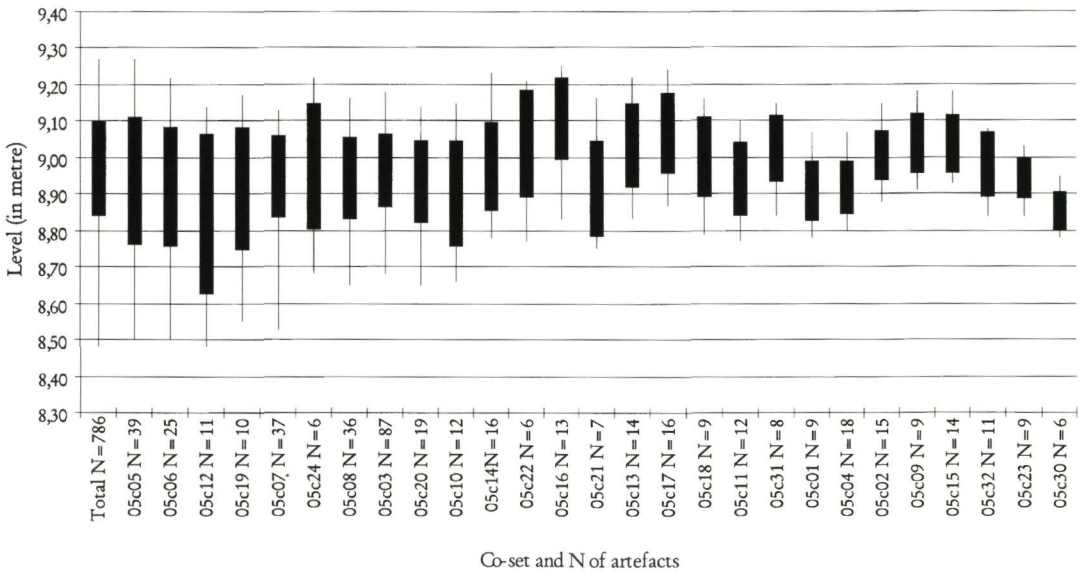
This sector shows an apparent accumulation of rocks at N18-19 E1 consisting of a large number of big slabs and a multitude of smaller, broken up rocks densely spread on a limited, sub-circular surface of about 1 sq m (Map 5; fig. 102). Inside this accumulation, two clusters can be discerned and are separated by a small open space. Numerous short distance refits show that many blocks in both of the two clusters were re-arranged inside this spot after their fragmentation by the fire. No further organisation appears. With the exception of one specific rock tool (*retouchoir*) amidst them, all of the rocks are burnt. This configuration reflects very well the type of *in plano* hearths known from other Upper Palaeolithic sites (*e.g.* Pincevent). Such hearths are littered all over with rocks, while there is no indication of a *cuvette* or a stone ring bordering the feature.

Separated from the hearth by a narrow circular belt of about 1.0m to 1.5m wide containing just a few small fragments, is a broad belt running west to SE and littered with mainly larger rocks. A few rocks excavated in the SE sector of the Rekem 12 trench, can also be associated with Rekem 5 West (as shown by the refits; Map 17). Most of the heavy-duty tools and rocks with hammered edges were abandoned in this outer zone around the hearth. These tools had been largely made on burnt fragments. Many of the burnt rocks ultimately refit to

103 *Rekem 5. Vertical dispersion of refitted artefacts.*



104 *Rekem 5. Vertical spread of refitted co-sets. Fine line gives maximum dispersion, bold line gives average dispersion ± 1 standard deviation. Ordering from left to right follows decreasing maximum spread.*



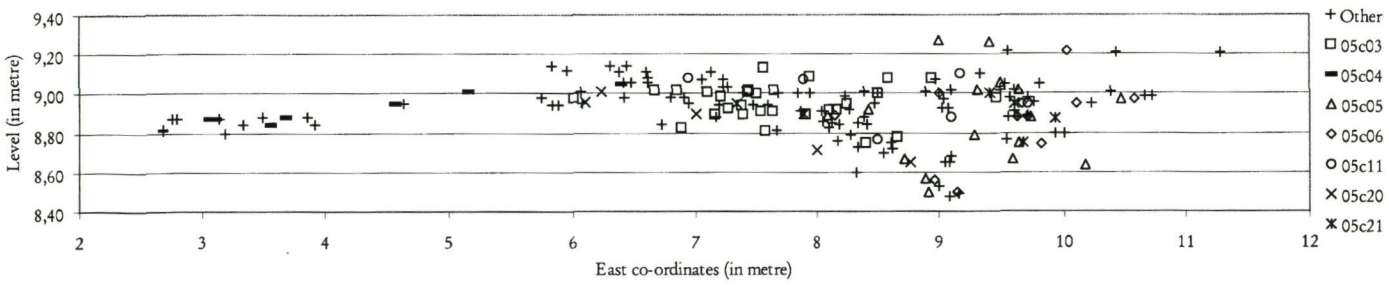
fragments in the hearth itself. The numerous refits, radiating in all directions, overlap short to middle-long distances (up to 5m), while some long distance refits could also be established with Rekem 6 and 12 (Map 25). It is quite possible that some of the non-refitted burnt rock-fragments also originate from this hearth. The evacuation of burnt stones from the hearth showed no preferred direction but, except for the long-distance inter-locus refits, they generally seem to stop at about 4m from the fire. If further removal was restrained by a structure there, then this would have had a more or less circular outline with a cross-section of some 7m. We will return to this hypothesis in the spatial analysis of the flint assemblage (section 6.2.7.4).

Unburned, very large slabs tend to be situated at the most remote edges, mainly at the S side of Rekem 5 East. Unlike the unburned elements of other concentrations, they show no obvious traces of use. If a dwelling had existed at Rekem 5, then they might have served to hold down a possible tent cover. Otherwise, these blocks may have been kept in reserve on the edges of the concentration.

Rekem 5 East

The eastern sector of Rekem 5 consists of a diffuse scatter of mostly burnt, flat quartzite slabs, without clear structural evidence. Unlike Rekem 5 West, this scatter lacks an obvious central concentration. However, three areas host an accumulation of burnt rock-fragments. The western edge of this scatter, at N15E6, includes a quasi-circular configuration with an inner radius of ± 1 sq m (fig. 101). Two piles of larger slabs may be discerned 2m NE and SE of this configuration, at N16E8 and N14E8 respectively. In the centre of the triangular zone thus defined, at N15E7-8, highly fragmented quartz pebbles (cooking stones) are abundant. The refitting of the burnt rocks shows a strong association between the three piles. Connection lines involving fragments of these piles depict, more or less, a pentagon of which three corners are marked by the piles (Map 17). Only a few connections continue outside this pentagon. The space thus delimited may be interpreted as a hearth area where one or more hearths were built and successively destroyed. As for the burnt stones outside this hearth area, many

105 *Rekem 5. Vertical spread along E-axis, of artefacts from various co-sets, found in band N15.00-N15.99.*



of which are rock tools, refits mainly join concentrations from outside Rekem 5 (mostly Rekem 6 and Rekem 12). Finally, some unburned (thus large) blocks are encountered toward the E and S edges of Rekem 5 East.

The absence of links between the hearth (plus its evacuation zone) in Rekem 5 West to the dense concentration of Rekem 5 East (except for one link of two very small fragments) seems to indicate two distinct uses of space that 'respected' each other. From both areas rocks have been transported for further use at Rekem 6 and Rekem 12.

6.2.7.4 Flint production

In addition to the rocks, Rekem 5 contains a very rich flint inventory, comprising 28 cores, 2547 blades and flakes (including 66 core rejuvenation products and 107 edge-damaged pieces), 2626 chips, 35 lumps, 281 tools and 145 tool waste products (Table 13). Altogether, the assemblage includes a quarter of all flint artefacts from habitation zone 1 (5662 items) and even 30% of the tools. The latter figure includes the whole range of types. While LMP (85 slender and 12 large elements) and burins (N=85) are dominant, the scrapers are also quite numerous (N=58) followed by a suite of 10 truncated tools, 7 borers, 5 becs, 3 reamers, 5 composite tools, and 11 randomly retouched pieces. Finally, 141 burin spalls and 4 Krukowski microburins have also been recorded (Table 34).

Notwithstanding these substantial numbers, more than a quarter of the artefacts could be refitted (Table 26), frequently in substantial co-sets (N=27) as well as in 120 refit sets (Table 25). These include 19 of the 28 cores (Table 29), 36% of the tools, and even 43% of the tooling waste products (Table 37), all hinting at complete *chaînes operatoires* having taken place in this locus.

Only 11% of the flint material showed microscopic alteration (Table 1). A wide variety of activities could be diagnosed by microwear determination. Bone or antler (80 IUZ, on all tool types except LMP, but essentially on burins and spalls), dry hide (35 IUZ, essentially on scrapers), fresh/wet hide (17 IUZ, on scrapers, but also on 2 fragments of a burin spall and on the refitting burin), (supple) dry hide (5 IUZ), undetermined hide (2 scrapers) and soft animal matter or carcass (10 IUZ; on 1 large LMP, 1 truncated tool, 5 edge-damaged pieces, and 3 unmodified blanks) were all processed at this locus. Two blanks probably served as fire-lighters. Finally, 51 of the 85 slender LMP could be diagnosed as having been used as missiles (3 as barbs, 45 as projectile heads, and 3 as barbs reused as projectile heads).

The following discussion will primarily focus on the organisation of the knapping and on the spatial structure of the flint scatters at Rekem 5 West and Rekem 5 East. The final section will briefly comment on the activities performed on and near the area of the hearth(s) in Rekem 5 East.

Rekem 5 West

Within the western area, most of the flint artefacts cluster near the hearth and its surrounding. In contrast with the rocks however, this accumulation is not restricted to a dense 1 sq m concentration but is instead dispersed over a wider sub-circular zone around the hearth (Map 6). It consists mainly of smaller blanks and chips, of which a considerable amount is burnt. While this might suggest that these elements were deposed simultaneously with the use of the hearth, the relatively high degree of non-burnt flint within the hearth area may imply that flint production continued after the extinction of the fire. This could explain the presence of the single non-burnt rock tool (*retouchoir*) within the hearth structure itself (cf. supra).

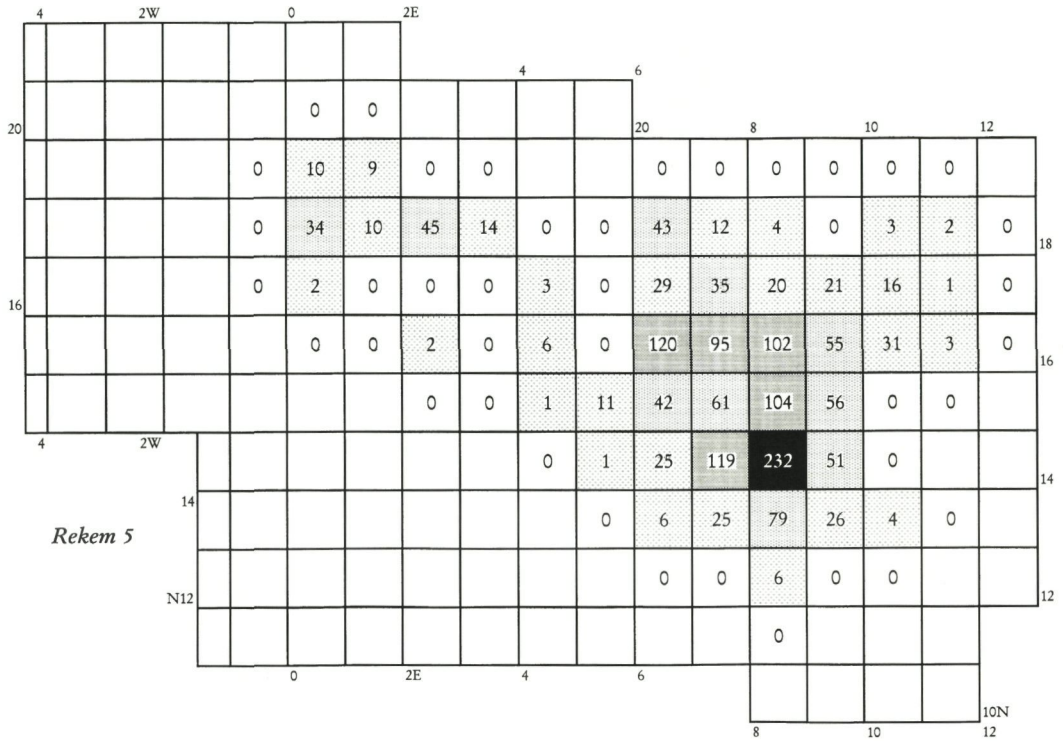
The distribution of the smallest chips, collected from the sieving, shows two accumulations at both the SW (N18E0) and the SE (N18E2) side of the hearth (fig. 106). Within Rekem 5 West, these spots presumably indicate areas where flint knapping took place.

It is therefore striking that cores are almost absent in this zone. Indeed, if this "hearth zone" is considered to be the centre of Rekem 5 West, then the cores and related larger elements are clearly situated in the peripheral zone, at the border of the broad belt that surrounds and delimits the western area. In fact, 8 of the 10 cores can be located within a perfectly circular belt only 0.5m wide and with a radius of 3m. The centre of this 'core-belt' (N17.50 E1.70) would be situated at about 1.5m south of the centre of the hearth (N19.00 E1.70). A similar phenomenon was also observed for the scrapers and, indeed, for most tools in general. Eight of 12 scrapers, for instance, can be located within a similar belt but this time with its centre in-between the hearth and the 'core-centre'. The 4 other scrapers were located within the hearth zone. Such peripheral belts correspond very well with a 'backward-toss-zone' described in ethno-archaeological studies[47]. An (unconscious) centrifugal effect results from the jettisoning of larger elements (as *e.g.* cores) and worn out tools, thrown away from the activity zone when they are considered to be no longer useful.

When the ring-method[48] is applied at Rekem 5 West, the following results are obtained for the different artefact categories when the hearth is chosen as the centre:

- For the artefacts as a whole (fig. 107), a unimodal distribution is produced which shows a concentration near the hearth which decreases in density towards the periphery. (The apparent new rise from 2.75m onwards essentially reflects the fact that the surfaces of distant rings are growing.)
- Regarding the cores (fig. 108), due to their limited number, the distribution pattern should be handled with caution. However, a clear distinction is visible when compared with the artefact distribution in that a centrifugal effect has apparently moved the cores (like larger rocks) away from the hearth.

[47] Binford 1983.
[48] Stapert 1992.



106 *Rekem 5. Distribution of flint chips collected from sieve, by 1 m².*

- For the tools (fig. 109), yet another distribution is shown. While, in contrast with the cores, the tools are clearly present near the hearth centre (first peak at 0.50-1.00m), they are also found at a distance, resulting in a second peak at 3.00-3.50m.

Observing this bimodal distribution for the tools, and fully bearing in mind that their number was limited, the question arising is: are we indeed dealing with a hearth inside a dwelling, the fireplace being located within the centre of this construction?

We would first like to deal with the second part of this question: should the hearth necessarily be situated in the centre of the possible dwelling and related activities? As shown above, the 'optimal' centre of the reconstructed core-belt, is 1.5m S of the hearth centre. Indeed this location may have been an ideal position for activities near the hearth. It also corresponds very well with the general location of the chips that mostly clustered to the SW and SE of the hearth (fig. 106). Throwing away cores in all directions and with equal force would, from this point, result in a circular distribution pattern. If these were guided by a 'barrier effect', then the hearth was not the exact centre of the circular construction, but situated somewhat more to the north. To test this hypothesis, the other artefact categories were also analysed starting from this core-centre. As can be seen on fig. 110-112, this resulted in remarkably bimodal distributions, very obvious for the tools (fig. 112) but also apparent for the artefacts in general (fig. 110). This phenomenon was not observed with the hearth as the centre (fig. 107). In all of the cases, the peak was produced at close to 3m, arguing for a barrier in this area.

In conclusion, when the 'core-centre' is used, all diagrams produced with the ring-method show a bimodal distribution. Most artefacts accumulated either in a drop-zone south of the hearth, or in a peripheral toss-zone, where a barrier effect at 3m suggests the presence of some construction. It may be noted that in comparison with many Magdalenian sites showing a bimodal distribution[49], this distance is rather high. Given the size of this construction, it can therefore be questioned whether a tent-like feature should be inferred, or rather some kind of windbreak or other 'open' structure.

In the further exploration of this model, the refitting results can be used to test the homogeneity of the distribution under consideration. In all, 150 elements are involved within 4 co-sets (05c02, 05c04, 05c16, 05c17; Map 43, 45, 52, 53) and 21 sets at Rekem 5 West. Another 5 reconstructions involve the re-assembly of lump fragments from crumbled cobbles (05c30-31, 05s124-125; Map 56). Raw material types suggest that more artefacts originally belonged to one of the refitted sequences. Within the 150 refitted elements of Rekem 5 West, 3 artefacts from Rekem 6 are included (and 1 from the Rekem 12 trench, but this fully belongs with Rekem 5 West; Map 58). As with the rocks, these inter-locus relations contrast with the absence of links with Rekem 5 East. In spite of intensive searching, hardly any connection with the dense eastern sector could be established (the position of two seemingly connected elements being really at the edge of the eastern sector!).

The distribution of the refitted co-sets at Rekem 5 West reveals distinct patterns for each of them

[49] Stapert 1992.

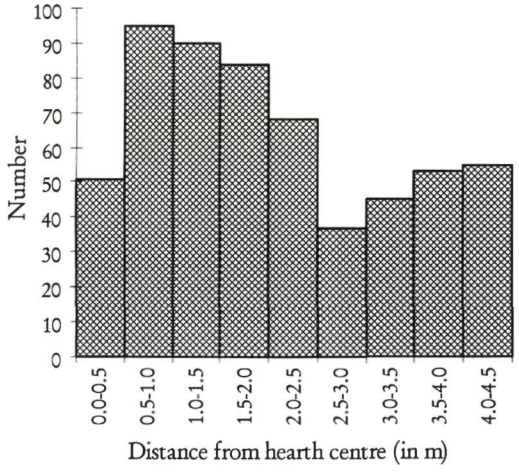
suggesting the former existence of independent deposition processes. However, three co-sets share common properties (05c02, 05c16 and 05c17). Their distribution corresponds very well with the defined hearth zone where mainly the smaller blanks were found. The cores, as well as the more voluminous elements in general, were clearly discarded at the peripheral zones. The place near the hearth zone might therefore be considered as the debitage centre (where the small flakes dropped and were afterwards ignored) while the surrounding belt received most of the robust waste material.

The direction in which this waste was removed clearly differs for the three co-sets: E and SE for 05c02, NW for 05c16 and both W and E for 05c17 (Map 43, 52, 53). A simultaneous production by different knappers or a changing position of a single knapper (with a possible time gap) may be held responsible for this. Given the divergent 'styles' of knapping, it seems that at least one skilful artisan, performing an adequate production of well-shaped blades (most of which seem to be exported; 05c17; Pl. 42), and one (or two) less competent knapper(s), generating clumsy handicraft with no economic productivity (05c02 and 05c16; Pl. 31, Pl. 42) were present. The presence of an adult with one or two juveniles, might possibly suit such an image.

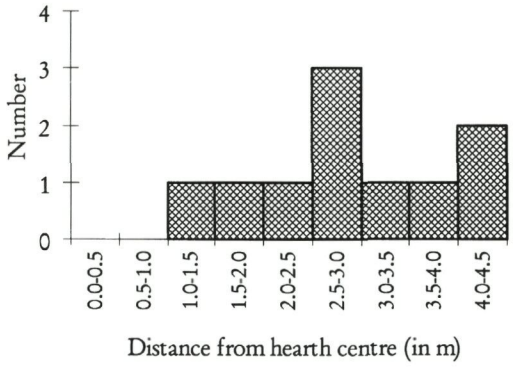
In all, it seems that the waste removal at Rekem 5 West was, in the first place, the result of intentional acts. These presumably took place during or immediately after the reduction activity. It seems more unlikely that they result from a continuous, random and unconscious process that lasted for the duration of the occupation (as *e.g.* scuffage or clearing). In this case, no such discrete distribution patterns would result for each of the separate refitted co-sets. Moreover, if a time interval existed between the knapping periods, then the distribution patterns of the artefacts produced during an early phase (and widely spread afterwards) would be expected to differ from the products of a final reduction (during the abandonment phase) since these latter artefacts should have moved only minimally[50]. This, however, is not the case. On the contrary, a very similar distribution is observed with regard to the distance of the artefacts (length of the refit-lines).

The location of the fourth refitted co-set (05c04; Map 45) clearly deviates from the three mentioned earlier as it occurs between the Eastern and the Western sector of Rekem 5. Although it was inventoried as belonging with Rekem 5 West, no connection with the centre of this sector could be established. In fact, many of the artefacts concerned were found along the SE edge of the circular belt that contains most of the cores from Rekem 5 West (cf. supra). The artefacts that deviate from the belt are projected to the East in a way that suggests that the belt apparently functioned as a barrier. This co-set would then be produced outside the possible structure.

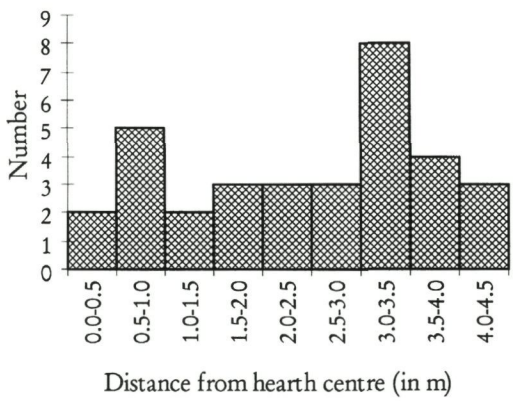
Some of the refitted sets confirm the tentative conclusions based on the refitted co-sets (Map 57).



107 *Rekem 5 West. Ring method for all flint artefacts. Artefact numbers in distance classes of 50 cm from centre of hearth (N19.0 E1.7).*



108 *Rekem 5 West. Ring method for cores. Numbers of cores in distance classes of 50 cm, from centre of hearth (N19.0 E1.7).*

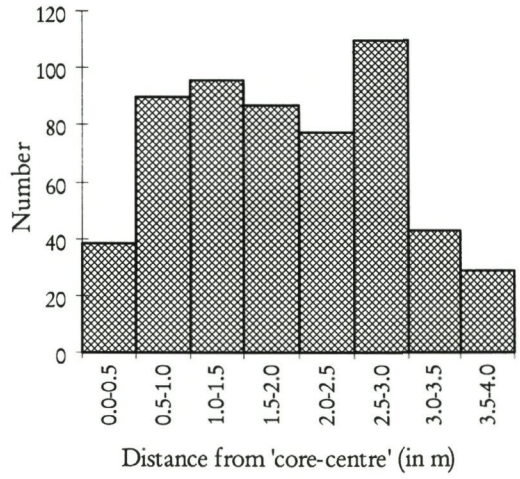


109 *Rekem 5 West. Ring method for all flint tools. Number of tools in distance classes of 50 cm from centre of hearth (N19.0 E1.7).*

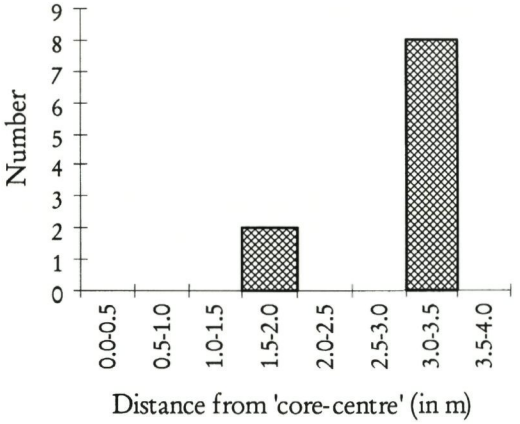
The spatial distribution of sets 05s008, 05s012 and 05s033, for instance, which are obtained from the same flint type (5/214) as co-set 05c16, and which could in fact represent a single reduction, all cover the same area. The two sets 05s048 and 05s007 are in turn part of another reduction, obviously knapped at the same spot. Furthermore, it seems very probable that 05s059 belongs with 05c17 (flint type 5/212), both of which share a similar dispersion.

The last type of conjoinment at Rekem 5 West concerns the relatively small cobbles that fell to lumps when struck. Exceptionally, a few random flakes could be removed, leaving one of the lumps

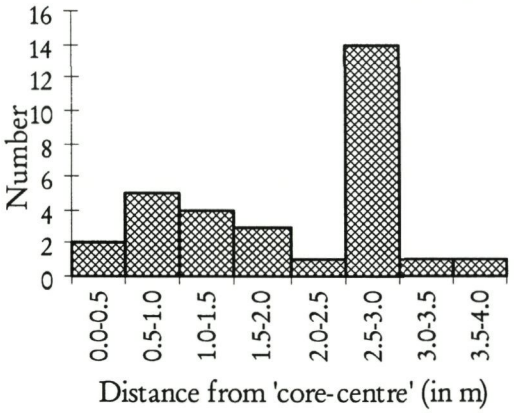
[50] Stevenson 1985.



110 *Rekem 5 West. Ring method for all flint artefacts. Artefact numbers in distance classes of 50 cm from 'core-centre' (N17.5 E1.7).*



111 *Rekem 5 West. Ring method for all cores. Number of cores in distance classes of 50 cm from 'core-centre' (N17.5 E1.7).*



112 *Rekem 5 West. Ring method for all tools. Number of tools in distance classes of 50 cm from 'core-centre' (N17.5 E1.7).*

as a (very irregular) core. The real cause for the poor quality of these flint cobbles is not very clear. The possible affection by fire cannot have been intense as typical fire-related features are lacking. Presumably, these cobbles suffered from natural internal flaws prior to their introduction at the site. From a spatial point of view (Map 56), three (05c31-32 & 05s125) are focused on the hearth, while the two others (05c30 & 05s124) are instead associated with co-set 05c04 from outside the circular belt of Rekem 5 West.

On the whole, the refitting evidence does not contradict the structural model outlined above. If a true dwelling existed here then the differences with Rekem 10 are quite apparent. Rekem 5 West contains no traces of hunting gear maintenance. Hardly any burins were left here (and they were not resharpened). The tools are not included in local debitage refits (but scrapers are connected with Rekem 6) and cooking stones are lacking. Interestingly, all these features are present in the adjacent concentration of Rekem 5 East.

Rekem 5 East

As opposed to Rekem 5 West, Rekem 5 East seems to have hosted a whole range of activities, resulting in a high density accumulation of flint, in addition to the abundant rock remains. The first impression of such an extensive assemblage of lithic material is that an enormous palimpsest was generated during repeated occupation episodes. However, the detailed analysis of the various activities performed here reveals an obvious spatial organisation suggesting that all this material may have been generated by a single group during one continued phase of occupation (see detailed descriptions in section 6.3).

In accordance with the conclusions stemming from the rock analysis, the dispersal of flint artefacts in this sector does not hint at the presence of a dwelling structure. While the sharp limit of the flint scatter along the SW edge seems to suggest a barrier effect, there is no good evidence to support this interpretation. Conversely, the instability of the repeatedly relocated hearth(s), the random scatter of other rocks and the range of activities carried out here (section 6.2.7.5) point instead to an open-air situation.

An initial over-view of the structure of this scatter can be gained from a comparison of the various refit plots (Map 43-56). As opposed to the situation inside the dwelling at Rekem 10, these plots present concentrated clusters, allowing for the position of the knapper(s) to be more or less discernible. This was unexpected since many of the sequences generated series of tools, which may normally be assumed to be more mobile than the debitage waste material (as at Rekem 10). Some of these knapping sequences were seemingly of rather high quality, others less skilfully elaborated, but no spatial pattern of differentiated knapping qualities could be discerned. It seems that at Rekem 5 East, the position of the knapper was essentially guided by the location of other ongoing activities.

6.2.7.5 *Activities in and around a large open-air combustion area*

The hearth(s) at Rekem 5 East attracted multiple activities in the course of its (their) use-life(s). In 'logical' order, this 'multi-purpose location'[51] served as an attraction pole for activities related to the procurement of game (maintenance of hunting gear),

[51] Binford 1983, 148.

butchering and food processing (cf. cooking stones), hide fleshing or dehairing (for which some construction may have been erected), dry hide working (possibly after smoking of the hide) as well as various aspects of bone or antler work. Notwithstanding this amalgamation of refuse-producing activities, occurring together at a single spot, each performance appears to have preserved significant intra-locus spatial patterning.

Like in the dwelling at Rekem 10, the hearth(s) of Rekem 5 East served for the removal of broken projectile points from their shafts resulting in a drop zone in the hearth area and thrown pieces in the periphery[52]. For the processing activities, the continuous sequences of flint knapping, tool production, use and discard on a single spot generally resulted in localised activity centres (sections 6.3.7 and 6.3.8). One exception was observed for dry hide working where the presence of the hide, presumably in a horizontal position (on ground level or extended in a frame), instigated the scraper consumers to separate the reduction and resharpening procedures from the location of the hide. This was situated outside the concentration (section 6.3.6.1.2).

Details of the spatial layout of all these activities are provided in section 6.3. In all, Rekem 5 East is perhaps best qualified as a (central) large domestic work area which reasonably implies the presence of a (larger) habitation nearby. Next to the activities related to subsistence, it is likely that Rekem 5 was also a focal point for a range of social functions.

6.2.8 Rekem 6

6.2.8.1 General observations

Rekem 6 was discovered on September 9, 1984, during the shovel cleaning of a Roman period horizon. Part of the scatter, especially the SE sector, was affected by later occupation, and it is likely that a fraction of the assemblage may have been lost. Additionally, the exact provenance of a considerable number of artefacts is not known. These obviously do not figure on the maps. In terms of excavated area, Rekem 6 is the largest locus, extending over a total surface of 187 sq m. The place was investigated using recording method A (see section 2.2.2).

The archaeological record at this locus includes 13.0kg of flint material, 0.7kg of quartz and 79.7kg of other mineral remains (Table 7). Both flint and rock materials at Rekem 6 seem randomly distributed (Map 7-8). The vertical dispersion of the artefacts ranges between 9.20m and 8.70m, but two thirds are situated between 9.10m and 8.90m.

6.2.8.2 Distribution of rocks

Rekem 6 contains the highest volume of rocks (more than 80kg) of the habitation zone 1 loci. They are spread over a surface of about 13 x 5-6m. The general distribution pattern is random (Map 7). The rock-strewn surface has a more or less crescent-like outline, the elongated stretch being E-W oriented. The density increases towards the E area and a limited cluster of rocks is comparatively isolated at the W extremity (N0-2 W0-E0). The total of burnt rocks is moderate (ca. 45%) when compared to the other loci where hearth structures are thought to have existed (Table 9). This low percentage is in full accordance with the limited fragmentation index for this locus (1.1; Table 10). Burnt and unburned slabs are found intimately linked. However, the majority of burnt slabs, especially many of the larger fragments, occur at the E border of the concentration.

Again, the refitting analysis helps considerably in solving some fundamental problems related to the interpretation of this chaotic scatter (Map 18). The lower degree of fragmentation and the fairly low number of small fragments (Table 10) together indicate a less intense or shorter use of a hearth than at Rekem 5. The concentration of large burnt slabs situated at the extreme E end of the scatter in Rekem 6 (N1-2 E10-11) also contains the most rocks broken *in loco* (many short distance refits). If this scant evidence points to the location of the original position of a fire, it must have been sited around square N1E11. The evacuation of burnt fragments was consequently essentially directed towards the West (Map 18). Many refits overlap long distances reaching up to 10m.

A possible explanation for the absence of an evident pattern of burnt rocks at Rekem 6 is perhaps not the intense or prolonged use of the fire place, for which there are few arguments, but rather the intense (re-)use of burnt slabs for other tasks, as testified by the large number of individual rock tools (Table 8; Map 18). Next to a concentration of hammerstones in the central area (N3E5), several clusters of heavy-duty tools can also be discerned. Interestingly, these spots are mostly connected with each other, as well as with other loci (Rekem 5, Rekem 10, and Rekem 13). Refit directions suggest that the rocks were generally imported from Rekem 5 to Rekem 6 but clearly exported from Rekem 6 to Rekem 10 and Rekem 13. In the two latter cases, it is interesting to note that the recycled rocks were collected at distinct locations. In a phase after abandonment, such 'scavenging' may have been another important factor in the disintegration of possible structures at Rekem 6. In conclusion, it remains a distinct possibility that such structure(s) did once exist. Taking into account the likely destruction of the SE sector of this locus, it is quite conceivable, for instance, that a circular construction once occupied the central part of Rekem 6.

6.2.8.3 Distribution of flint

In comparison with the abundance of rocks, the flint inventory at Rekem 6 is relatively moderate. It includes 43 cores, 1486 blades and flakes (including

[52] Caspar & De Bie 1996; see section 6.3.4.2.

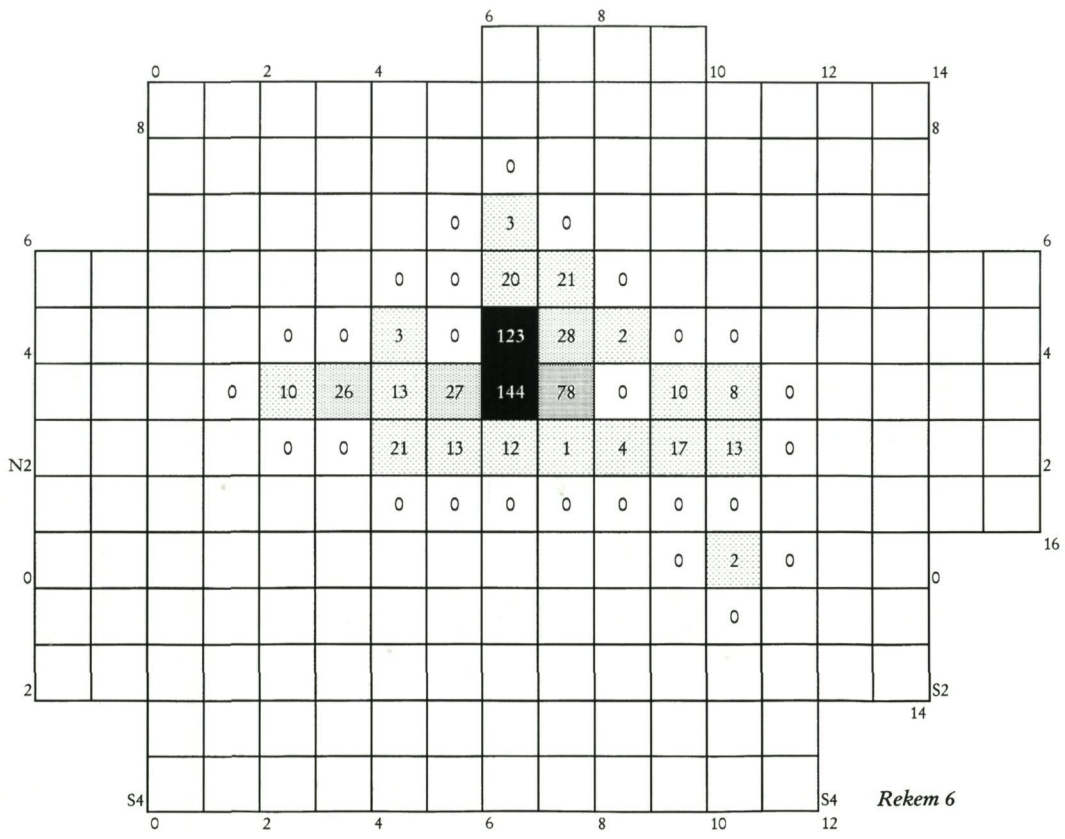
51 core rejuvenation products and 36 edge-damaged pieces), 925 chips, 15 lumps, 179 tools and 65 tooling waste products (Table 13). The tool spectrum is, however, quite diverse with 54 LMP (49 slender and 5 large elements), 53 burins (for 65 burin spalls), 41 scrapers, 16 truncated tools, 4 becs, 3 borers, 1 reamer, 3 composite tools, and 4 randomly retouched pieces (Table 34).

With only 13% of these pieces refitted – in 7 co-sets and 67 refit sets (Table 25) – the refit rate at Rekem 6 remains below average (Table 26). Only 17 of the 43 cores (Table 29) and only 10% of the tools (18/179; Table 37) can be refitted.

Almost a quarter of the flint material was affected by microscopic alteration (Table 1). Nevertheless, a wide variety of activities could be identified on a broad spectrum of tool types. The working of bone or antler (45 IUZ; on burins and spalls, but also on scrapers, borers, becs, composite tools, and randomly retouched pieces), dry hide (16 IUZ; on scrapers, truncated tools, and edge-damaged and unmodified blanks), fresh /wet hide (1 scraper), undetermined hide (1 scraper), soft animal matter or carcass (1 burin, 1 scraper, 2 truncated tools, and 2 unmodified blanks), and wood (5 scrapers) could all be detected. 22 slender LMP and 1 truncated tool are identified as used missiles (1 as barb, the others as projectile heads). Finally, 1 reamer and 2 randomly retouched tools presumably served as firelighters.

Although the overall distribution of the flint artefacts generally coincides with the distribution of the rocks, a denser concentration can be discerned at N3-4 E6, which more or less corresponds with the cluster of hammerstones noted above (Map 8). This sector also contains the highest concentration of chips (fig. 113). Several co-sets (06c02, 06c03, 06c05; Map 59-61) and refit sets (Map 63) further support the interpretation that this place partly functioned as a knapping area. On a similar basis, another debitage area may be discerned near the (hypothetical) hearth in the E part of the scatter (at N2E9-10) where co-set 06c01 (Map 59) and several refit sets were located (Map 63). Both clusters are immediately apparent on the synthetic refit map of Rekem 6 (Map 64). This map also reveals that both knapping areas were closely connected with Rekem 5 West and East.

Except for some long-distance break refits and the occasional conjoinments of burin spalls to burins, hardly any refit could be made in the area surrounding the knapping spots at Rekem 6. Various factors may be responsible for this low refitting rate. Next to possible disturbance, which also seems to have affected the rocks (see above), it was noticed that most of the blades at Rekem 6 were made of a very homogeneous type of grey flint, which did not alleviate the refitting task. In addition, a number of these artefacts were apparently imported, as evidenced by the numerous connections with Rekem 5



113 *Rekem 6. Distribution of flint chips collected from sieve, by 1 m².*

(Map 64). The artefacts transported from Rekem 5 to Rekem 6 are generally very well-shaped blades (*e.g.* two blades from co-set 05c09; Pl. 39; two blades from sets 05s069 and 05s070, probably belonging to a single nodule, etc.), or tools. The burin refitted in set 05s069 was manufactured at Rekem 5 (where its burin spall was found), before being transported to Rekem 6 (Pl. 82.10). Given this selection, it seems unlikely that these elements are the result of refuse clearing from Rekem 5. Their transport to Rekem 6 was probably intended for (further) 'consumption' at this nearby location.

The spatial layout of the activities performed using the main tool categories at Rekem 6 is discussed in section 6.3. With regard to the LMP, Rekem 6 certainly served as an area where used projectiles were removed from their shafts, but the spatial pattern is less clear-cut than at Rekem 5 and Rekem 10 (section 6.3.4.2). For the scrapers, different areas could be distinguished, but these generally contained scrapers used on various hard materials (bone/antler, wood) in addition to all the different stages of the hide working process (section 6.3.6.2.1). Only in the NE part of this sector, an isolated oval-shaped concentration containing 7 scrapers and comparable to the arrangement in Rekem 5 East, may point at a local dry hide scraping activity. Unfortunately, this worked material could be identified on only 1 specimen, as the other scrapers appeared unsuitable for adequate microwear analysis. Finally, the burins at Rekem 6 had been almost exclusively used on bone or antler but they did not display any unequivocal spatial patterning (section 6.3.7.5.2).

In all, Rekem 6 may for the moment best be interpreted as a large work area harbouring a very wide range of activities and partly functioning as a satellite of Rekem 5. Further investigations are needed for the refinement of this interpretation but it is likely that the partial destruction of this locus will always hamper its full comprehension.

6.2.9 Rekem 12

6.2.9.1 General observations

Rekem 12 was first investigated in 1982 during the excavation of a Protohistoric ring-ditch that had severely destroyed part of the lithic concentration[53]. The actual excavation of the *Federmesser* level started on September 17, 1985. A total area of 137 sq m was investigated using recording method B (see chapter 2).

The inventory at Rekem 12 totals 8.6kg of flint material, 0.24kg of quartz, 90g of red ochre and 23.77kg of other mineral remains (Table 7). The overall spatial layout of Rekem 12 presents a principal concentration in the SW sector of the trench with extensions of scattered material in various directions to the NE and the E (Map 13). The outline of the Protohistoric disturbance is clearly visible as an empty band in this configuration.

The detailed vertical distribution of the artefacts is still under investigation, but the spread generally falls between 9.20m and 8.90m.

6.2.9.2 Distribution of rocks and flint

In spite of the fact that almost 25kg of rocks were found at this locus, no evident structure was identified. The volume of rocks was primarily the result of a few large blocks spreading throughout the locus. 42% of the non-flint rocks were burnt. These occurred mostly in the S-SE part and were associated with a series of rock tools. The quartz fragments at Rekem 12 are all distributed in the NE section of the scatter, at N14-16 E17-19. The refitting results for the rocks are limited, but they connect a fragment outside the circular disturbance with the scatter enclosed by this same feature (Map 22). In addition, the refitting established several links with both areas of Rekem 5 to the SE.

The flint inventory from Rekem 12 includes 16 cores, 892 blades and flakes (including 40 core rejuvenation products and 38 edge-damaged pieces), 1109 chips, 4 lumps, 71 tools and 32 tooling waste products (Table 13). In quantitative terms, this resembles the figures at Rekem 10. The tool assemblage consists of 33 LMP (29 slender and 4 large elements), 19 scrapers, 13 burins, 2 truncated tools, 1 bec, 1 reamer, 1 composite tool, and 1 randomly retouched piece. Finally, 28 burin spalls and 4 Krukowski microburins have also been recorded (Table 34).

18% of the flint artefacts could be refitted (Table 26), in 4 co-sets and 43 refit sets (Table 25). These include 5 of the 16 cores (Table 29), 14 of the 71 tools, and 10 of 32 tool waste products (Table 37).

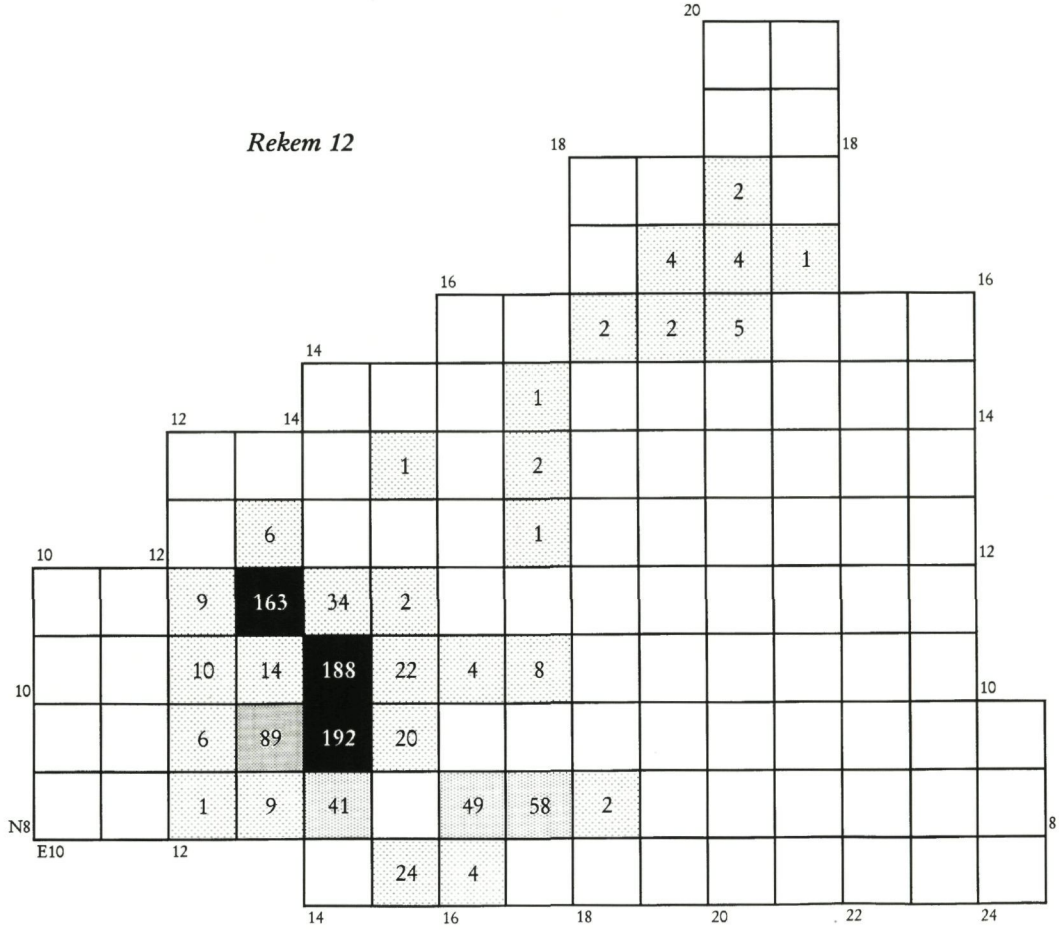
Only 8% of the flint material showed microscopic alteration (Table 1). Use-wear analysis revealed the working of bone or antler (6 IUZ; on 3 burins, 1 scraper and 1 bec), dry hide (9 IUZ; on 5 scrapers, 1 composite tool, 1 edge-damaged piece, and 2 unmodified blanks), fresh/wet hide (1 scraper), carcass (1 edge-damaged piece) and non-woody plants (1 burin spall). The slender LMP included 11 diagnostic projectile heads and 2 barbs.

The spatial distribution of the various tool categories and their uses are discussed in section 6.3. Despite the absence of any evident patterning for the LMP, the locus seems to have attracted arrow-retooling activities. The distribution of scrapers and burins is even less well defined. On the whole, accurate interpretation seems to be severely hampered by the partial destruction of this locus.

The distribution of chips retrieved in the sieving, shows clustering at several locations in the main concentration and, to a lesser degree, at N8E16-17 (fig. 114). These locations correspond with the presumed flint knapping areas as suggested by the refit maps: co-set 12c01 (Map 89) is situated in the central part of the concentration, co-sets 12c04 and 12c05 on the SE edge (Map 91-92). All the con-

[53] De Boe 1983a. The fieldbook records that some flint tools collected on this occasion by M. Lodewijckx, could not be retraced.

114 *Rekem 12. Distribution of flint chips by 1 m².*



joinments bridge areas on both sides of the protohistoric trench.

Despite the apparent preservation of knapping areas, the artefacts of co-set 12c01 are widely distributed, a phenomenon that was also observed inside the dwelling at Rekem 10 (*e.g.* Map 74-75). In fact, the general refit map at Rekem 12 (Map 95) is very similar to the refit map for Rekem 10 (Map 79). The pattern along the SW arc in particular is strikingly similar at both loci. Another common feature is the presence of several cores along the S edge. However there are much fewer rocks at Rekem 12 (though an important though unknown quantity may be missing as a result of the Protohistoric trench) and the distribution of quartzes is completely different. At Rekem 12, they are isolated in the N extension of the scatter. It is not clear whether this may also be ascribed to posterior disturbance.

Because of the partial destruction, it is difficult to establish the precise significance of Rekem 12. If a dwelling structure similar to the one at Rekem 10 existed here, then a remarkable parallel emerges. The (triangular) spatial relation of Rekem 12, 15 and Rekem 16 compares very well with the triangular arrangement of Rekem 10, 7 and 11 (fig. 1). Rekem 7 and Rekem 16, in turn, could be both connected with Rekem 1 (Map 27).

6.2.10 Rekem 1

6.2.10.1 General observations

Discovered during the initial days of the first field campaign (August 1984), it was immediately manifest that an extremely dense scatter of artefacts appeared over a very limited area at this locus. In quantitative terms, more than one fifth of all the flint items of habitation zone 1 were found here and most of them clustered on a surface of only 1 sq m (Map 3). The edges of this cluster are quite sharp though dispersed artefacts are scattered around it in all directions. To the N, the locus is partly destroyed by a protohistoric ditch. A total excavated surface of 71 sq m was surveyed using recording method A (see chapter 2). The vertical scatter at Rekem 1 is relatively important for such a small surface, but most elements occur between 9.20m and 8.90m.

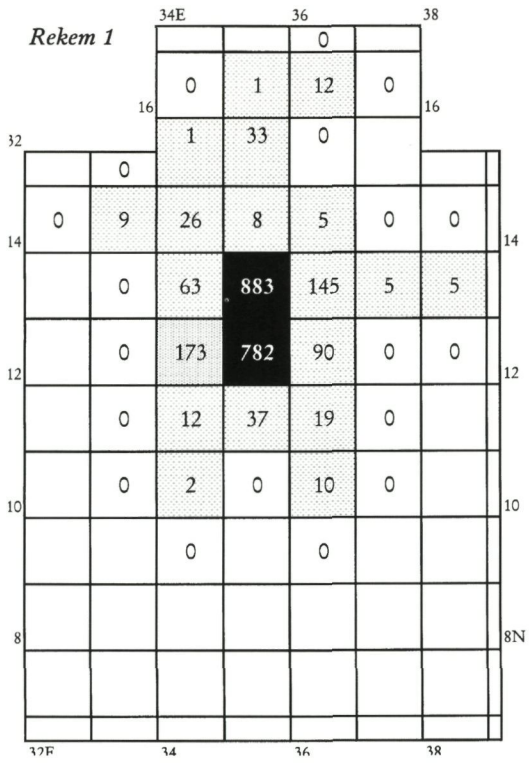
In addition to 10.6kg of flint material, some 17.9kg of other rocks have also been catalogued (Table 7).

6.2.10.2 *Distribution of rocks*

Compared with the (restricted) horizontal distribution of the flint artefacts, the other rocks cover a larger area (ca 12-15 sq m), especially to the SE (Map 3). In the centre of the scatter (N12-14 E35-36), corresponding with the distribution of flint material, small fragments of burnt rocks are associated with an important number of flaked rock fragments. All these remains are clearly burnt. Larger, unburned blocks are separated from this concentration, circumscribing it in a small belt, especially on the W and S side. Some rock-tools figure amongst them (Map 16). Except for one tiny fragment, quartz is completely lacking at Rekem 1.

About half the number of fragments could be refitted (Map 16). Most of the connections were located in the central accumulation of lithics and affect burnt material only. A few of the refits join with burnt, larger 'heavy-duty tools' in the outer belt. Although the refitting potential is presumably nearly exhausted at this locus, the reconstructions never result in a more or less completely reconstructed block. It is clear that different parts of the blocks are lacking here, a result that is not normally observed at the other loci. It is therefore improbable that the firing of these rocks occurred on this spot. They are possibly the result of a dump of burnt remains gathered form the clearing of a hearth elsewhere (the clearing of hearths was obvious at most of the other loci). So far, however, no long distance rock refits could be established from Rekem 1 to the other loci.

The outer belt of large unburned blocks represents a different feature. It is not inconceivable that these rocks were intentionally stored here, separated from the pile of small useless waste debris.



115 *Rekem 1. Distribution of flint chips collected from sieve, by 1 m².*

6.2.10.3 *Distribution of flint and discussion*

The flint inventory at Rekem 1 includes 32 cores, 1503 blades and flakes (including 62 core rejuvenation products and 35 edge-damaged pieces), 2973 chips, 11 lumps, 113 tools and 35 tool waste products (Table 13). The tools are dominated by LMP (38 slender and 10 large elements), and burins (N=27). As opposed to the high number of truncated tools (N=21), scrapers are rare (N=10). The other tools comprise 1 borer, 1 bec, 2 composite tools, and 3 randomly retouched pieces. Seven Krukowski microburins and 28 burin spalls complete this list (Table 34).

With only 16% of the artefacts refitted (Table 26), in 11 co-sets and 43 refit sets (Table 25), the relative refit score at Rekem 1 is rather low. Still, in absolute terms, Rekem 1 comes off second best (264 refitted pieces). The refitted assemblage includes 19 of the 32 cores (Table 29), 25 of the 113 tools, and 9 out of 35 tool waste products (Table 37). Flint refits also join Rekem 1 with Rekem 7 and Rekem 16.

The microscopic condition of the flint material at Rekem 1 appeared excellent. Only 4% were affected by mechanical alteration (Table 1). On the other hand, numerous pieces are burnt. Use-wear analysis revealed a fairly limited range of activities. These consist of the working of bone or antler (13 IUZ, exclusively on burins), dry hide (6 scrapers), carcass (2 burins), unspecified hard matter (1 edge-damaged piece) and a use as firelighter (1 burin). 17 slender LMP and 1 truncated tool could be diagnosed as used missiles (including 1 barb). The spatial distribution of the various categories of used tools is presented in section 6.3. Since most of these occur with the debitage waste in this dense concentration, no specific patterning could be distinguished.

The density of flint material in N12-13 E35 is also reflected in the concentration of chips on this spot (fig. 115). The cores, on the other hand, are generally found on the edges of the tight cluster. With one exception (co-set 01c10; Map 35), seemingly produced in the NE periphery of Rekem 1 (but connected with the dense cluster), all co-sets were situated at the same location. If they were knapped locally, the position of the knapper cannot have changed much. On the other hand, the technological analyses of the various sequences suggest that different levels of knapping quality were at work here (section 4.4.2.1). Moreover, a wide range of flint types was also exploited. In all, it is unlikely that one knapper at one particular moment performed all the flint reducing activities at Rekem 1. In this respect the locus differs from *e.g.* Rekem 15 (presumably one single knapper), Rekem 7, and Rekem 16 (possibly 2 artisans).

The question therefore arises as to whether Rekem 1 should be interpreted as a secondary refuse deposit of lithic debris and/or of hearths (as suggested by the burnt rocks). The latter would also explain the high number of burnt flints (26% of all burnt items at Rekem occur here). This interpretation as a dump zone was forwarded earlier in our analysis of the LMP[54]. However, new refits assembled since that publication (*e.g.* several rejected LMP refitted in co-set 01c05 and refit set 01s50; Pl. 24) suggest that this locus at least partly functioned as a tool production workshop as well. This interpretation may be supported by the co-sets including burins that completely lack traces of use (01c01, 01c02, 01c03, and 01c11; compare with the situation at Rekem 15). It remains a possibility that such a knapping area subsequently attracted the additional dumping of debris from activities performed elsewhere (which could explain the presence of use-wear on those pieces), while in turn the abundance of lithics may have occasionally stimulated further reduction on this spot. All this would imply that, in spite of its extremely limited extension, Rekem 1 may be the result of repeated and dynamic formation processes.

6.2.11 Rekem 4

Discovered in August 1984, this locus was carefully investigated (recording method A) over some 90 sq m, but on the whole contained little material. Because rocks are virtually absent, only one general map has been produced (Map 4). This shows a low-density scatter of artefacts. The inventory includes 9 cores, 167 flakes and blade(let)s (including 4 tabular flakes), 3 lumps, 25 chips, 2 slender LMP, 6 burins, 1 scraper, 2 truncated tools, and 1 burin spall (Tables 13 and 34). 49 elements (26%) refit (Table 26) in 2 co-sets and 9 sets (Table 25) that are generally formed by widely dispersed elements (Map 42). By contrast, the products of 1 co-set that generated a series of bladelets (04c02) are tightly clustered over 1 sq m (Map 41). Most of the 33 pieces subjected to microwear analysis were well suited for use determination (Table 1), but only 2 burins showed traces of utilisation (counting not less than 5 IUZ on dry hide!). One of the two LMP had been used as a projectile head.

On the whole, next to some occasional knapping in this sector, Rekem 4 generally seems to be a (transition) zone where tools were sporadically being abandoned (lost?). None of them could be refitted.

6.2.12 Rekem 8

On the penultimate day of the 1984 campaign, a few artefacts were found near the S wall of the main trench. These were catalogued as Rekem 8 (fig. 1). However, further excavation in the adjacent trench in 1985 did not reveal an extension of this scatter. Rekem 8 can therefore not be interpreted as a real concentration. The 18 artefacts registered here comprise 13 flakes (including 4 with damaged edges), 1 blade, 3 scrapers, and 1 randomly retouched tool (Tables 13 and 34). None of these pieces could be refitted (Table 26). Six out of 8 specimens investigated for use-wear appeared to have been heavily altered (Table 1). One scraper was used on dry hide. The total area surveyed as 'Rekem 8' covers ca. 21 sq m.

6.3 A chain of activities at and away from a *Federmesser* settlement

6.3.1 Site selection and procurement of raw materials

As discussed in chapter 2, it is easy to imagine why this sand ridge on the left bank of the Meuse attracted a group (or groups) of Late Palaeolithic hunter-gatherers. All the necessary subsistence resources, water, and abundant lithic material, were available at this location.

The equipment brought from former settlement(s) presumably included an assortment of red ochre and a few shaft polishers in addition to some flint material. The flint includes items such as pieces of flint type 4, shafted projectile points, a series of blades, and some domestic tools. They probably also imported a range of organic objects, for which any direct evidence is lacking. Most of the lithic raw materials, however, could be gathered locally. For flint, this apparently occurred on an *ad hoc* basis ('on demand'). There are, in any case, no remnants of unknapped flint nodules stored for later exploitation. In view of the extremely versatile procurement criteria (and the presence of poor quality blocks), it is quite conceivable that juveniles were asked to gather flint when needed.

Larger rocks were seemingly introduced on a more systematic basis, possibly during the initial stages of the occupation (while building structural features). There are some indications that they were stored 'in reserve', mostly in the peripheral areas of the large habitation sites (Rekem 10, Rekem 6 & Rekem 5) but also at Rekem 1. In the course of the occupation, these blocks were continually recycled and reused, a routine that was not practised to the same degree with the flint nodules (see section 6.3.3).

6.3.2 Building and maintaining structural features

It is striking to note the small number of well preserved hearth structures at a settlement like Rekem. This is especially so when its more than 12 individual spatial assemblages of lithic remains are

[54] Caspar & De Bie 1996.

considered and which, for the greater part, bear heavy traces of fire, especially the non-flint material. The spatial analysis and refitting of the rocks has shown that the high degree of fragmentation amongst burnt stones and their progressive dispersion and abandonment, mixed with other waste materials, was due to the successive cleanings of the hearths. This also implies that the accumulations of burnt rocks are not necessarily an indication of an *in situ* hearth (*e.g.* at Rekem 1). On the other hand, heavy-duty tools were occasionally recycled and used to build a hearth structure in another location (Rekem 13).

The exact function of the numerous 'rock tools' remains largely conjectural, but some clusters seem to indicate distinct loci of activities (*e.g.* the concentration of hammerstones/*retouchoirs* amongst debitage waste at Rekem 6). On the other hand, the concentration of heavy-duty tools in the presumed hearth at Rekem 13 shows that such clusters do not necessarily reflect the immediate area of use. The presence of quartzite flakes at some loci (*e.g.* Rekem 7), while the tools of which they were struck were not abandoned there, presumably reflects a place of tool manufacture or secondary trimming, and thus corroborates the high mobility of these items. The refits between flakes in other concentrations generally span short distances, while the connections with the tools reveal that the latter often spread over larger distances, again indicating prolonged use or reuse. In other loci (*e.g.* Rekem 5) however, short distance refits suggest a local 'consumption' of the rocks. The fact that heavy-duty tools are also very often burned, shows that they were frequently manufactured on recycled hearthstones, or in turn recycled after use (*e.g.* at Rekem 13). On the whole, the 'rocks' at Rekem appear to be an extremely mobile class of object, travelling both between and within concentrations.

The latter characteristic could be exploited for the identification of barrier effects and the inferred presence of dwellings. The spatial analysis has suggested that (at least) two types of habitation structures may have existed at Rekem. On the one hand a light-weight construction (skin tent?) or merely a windbreak, with a cross-section of 6-7m, was presumably present at Rekem 5 West. On the other hand, a more stable dwelling, with a cross-section of 5-6m can be inferred at Rekem 10. The pattern of activities observed at both habitations is quite distinct. At Rekem 10, a range of domestic activities (except for fresh/wet hide scraping) points at extensive habitation inside the dwelling. At Rekem 5 West, conversely, no clear indications of locally executed activities could be established, except for some flint knapping, possibly at the end of the occupation (preparation of blades). Instead, this 'habitation' is characterised by a very low density of flint artefacts. Refuse-producing activities may have been performed outside, possibly near the adjacent hearths of Rekem 5 East and (maybe) at Rekem 6. In contrast with the situation at Rekem 10, the activity range at these places covers the integral processing of animal substances (including hide fleshing). The refitting of rocks (see section 6.4.1) has shown that Rekem 10 contains items recycled from Rekem 5 and Rekem 6, hinting at a later occupation. In all, it is not impossible that the differences observed at both areas might reflect seasonal variety. Habitation during the cold season at Rekem 10, for instance, could explain the possible presence of a floor mat and of a hearth inside the dwelling, where large rocks were repeatedly warmed. Better seasonal conditions at Rekem 5, on the other hand, would then explain the focus on outside activities.

6.3.3 Flint knapping

Whereas numerous aspects of flintknapping have been discussed in chapter 4, the systematic analysis of the spatial output of this 'activity' has provided further insights.

In most cases, it seems that blocks at Rekem were generally knapped in one continuous sequence, possibly followed by an inspection of the blanks produced. If not suited for the task at issue, these were seemingly removed from the pile of debitage and ended up slightly further away (cf. Rekem 15). Cores, in general, were also tossed away in various directions, except when they broke and fell between the debitage waste (*e.g.* co-set 11c02). At Rekem 7 and Rekem 11, there is also evidence for cores having been purposely discarded (placed?) in one corner of the knapping spot. Inside a dwelling, finally, artefacts of a single production sequence ended up widely dispersed.

At the knapping spots, different nodules could be reduced by (presumably) one knapper maintaining an unchanging position. On the other hand, most refitted sequences at Rekem cannot be claimed to be 'complete'. In most cases, part(s) of the reduction is missing. However, there is practically no evidence for knappers having moved around in habitation zone 1 and having reduced the core in different stages, at different locations[55], a process that has been repeatedly observed at *e.g.* the Magdalenian sites of the Paris Basin[56]. If the missing parts of the reductions at Rekem do not simply reflect failing refitting achievements, it must be concluded that they were exported to outside habitation zone 1. A consequence of this behaviour is that the refitting of flint blocks reveals little about the possible relations between the various loci inside the habitation zone (but see section 6.4.1).

Transport of individual flint items was a more common practice, though certainly not the rule with

[55] The only evident exception being co-set 16c01 (see section 4.4.2.11).

[56] Cf. Bodu 1996, 68: "*Until very recently, it was thought that flintknapping was a particularly static activity, that a knapper remained in the same place during the entire process. The refittings [at Pincevent] have shown that this was not necessarily so in a Magdalenian camp. In many cases, it has been possible to demonstrate that a core had been worked in several places within the same unit, even between different features.*"

the exception of the projectile points and barbs. Tool mobility will be discussed in the following sections, but there are also indications of unmodified blanks having been transported. The blades of co-set 05c09, for instance, *i.e.* butchering knifes distributed in Rekem 5 and 6, were presumably not produced locally, but were introduced as finished items. The blades obtained from co-set 05c17 at Rekem 5 West, by contrast, were seemingly exported away from this habitation, and may illustrate the other side of this practice.

On the other hand, it should be emphasised that the products made of extra-local black flint (type 4) are generally not well-shaped blades. They primarily include small or irregular flakes, as well as some completely exhausted cores. On a larger scale, such transportation of casual items was also recorded at Niederbieber, where all sorts of imported artefacts were abandoned – a practice hardly or not observed at Magdalenian sites[57].

Finally, whereas the discussion on various levels of knapping quality was largely presented in chapter 4, some additional observations can be made. Firstly, it could be clearly established that in the context of larger habitation sites, the position of the knapper was primarily guided by the activities for which the tools were intended. This location, in turn, was co-determined by the inherent constraints of the performance at issue (need of heat, need of space, etc.). The only notable exception to this rule relates to the production of LMP (section 6.3.4). Secondly, in spite of an apparent lack of flint knapping 'organisation' (in terms of 'hierarchical positioning'; see section 4.6.2), the technological and spatial analysis of the reduction sequences may yet provide some clues about the inhabitants. Inside the dwelling at Rekem 10, for instance, very consistent and competent knapping suggests that essentially one artisan (a hunter?) was at work here. This was also observed with regard to the 'style' of the LMP. On the other hand, the occurrence of at least one inferior level of knapping quality implies that different persons were involved. In a dwelling, a nuclear family seems most likely. Similarly, at Rekem 5 West, at least two levels of knapping quality were revealed. In this case, the clumsy handicraft of the inferior level might point at the presence of juveniles[58].

6.3.4 Hunting and maintenance of weapons

Whereas the 'spatial organisation' of the actual hunting parties is evidently not reflected in a camp layout, activities related to the fabrication and maintenance of weapons have generated clear patterning inside the settlement at Rekem. The results of the functional analysis and the relative frequency of LMP compared to the other tool-categories, vary considerably among the distinct concentrations and support the major distinction between large "domestic" structures (*e.g.*, Rekem 5 and 10) and smaller, limited-use areas (*e.g.*, Rekem 1, 7, and 11; Map 119-120). Moreover, intra-locus distribution maps revealed how aspects of manufacture, repair, and abandonment of hunting equipment were spatially separated. We will consider these aspects in the order of a weapon-handling flow model.

6.3.4.1 Production areas: Rekem 7 and Rekem 11

Rekem 7 and 11 can be defined as locations for the primary manufacture of LMP. The centres of both concentrations, each containing about 2000 artefacts, are small, almost circular (± 5 sq m), and surrounded by isolated stray finds (Map 9, Map 12). Non-flint rocks represent less than 0.5% and do not delimit any structure. The lithic assemblages comprise relatively few tools, indicating limited activities, in particular the primary processing of local flint (section 6.2.4 and 6.2.5). Within these small workshops, LMP are at first sight randomly scattered (Map 121, Map 122). They represent the most important tool-category, up to 71% of the tools at Rekem 7, and about half of the assemblage at Rekem 11 (Table 34). At both units, slender and large pieces are encountered in almost equal numbers. In fact half of the large pieces of the entire Rekem assemblage are located at these two concentrations.

The thesis that Rekem 7 and 11 were the production places of LMP can be supported by various arguments. Firstly, the detailed flint type analysis of these pieces shows that almost half the LMP were produced locally (17 of 36 pieces at Rekem 7, 11 of 26 pieces at Rekem 11; Table 48; codes 1, 2, 24, 3). Secondly, 8 LMP could be conjoined in local dorsal-ventral refits, some of which include core preparation (co-sets 07c06, 07c08, 07c09, 11c08 and sets 07s25, 07s32, 07s36, 11s17; see for details section 5.2.4.1). Thirdly, the local manufacture of LMP is reflected by waste fragments which broke as a consequence of backing. This is shown by their fracture types. There are numerous Krukowski microburins (17 at Rekem 7; 9 at Rekem 11), trihedral points (negatives of Krukowski microburin scars) occur on 11% of the LMP, and there are snap fracture facets with a bulbar zone on 15% of the fractures (excluding thermic and diagnostic projectile fractures). Refitting 26% of these elements (four pairs of fragments: Pl. 72: 10-11,12-13,15-16, Pl. 73: 21-22, and two refits with Krukowski microburins: Pl. 72: 8-9) within short distances, argues for tooling on the spot. In fact, the relative abundance of snap fractures may also be linked with the tooling procedure, be it shaping mishaps or intentional breakage. Finally, the scantiness of micro- or macroscopic use-wear traces demonstrates that these units scarcely include used projectiles (only 5), or butchering tools (N=4). The latter traces associate them with other "domestic" tool categories (burins, scrapers, etc.), which were generally made, used, and discarded on the spot (see below), whereas projectiles would have been used away from the site.

[57] Floss 1994.

[58] Their attendance could also explain the introduction of extremely poor quality flint ('crumbled cobbles') at Rekem 5 West.

The well-balanced ratio of slender to large pieces at these manufacture zones is not reflected within the large domestic units (section 6.3.4.2). The width of the large elements at Rekem 7 and Rekem 11, however, does not often deviate much from the 12 mm limit, while backs are frequently incomplete (Pl. 72: 1,3,8,13, Pl. 73: 16). As these specimens were never used, we assume that they were discarded before a substantial part of the body was removed by backing. So the many unused large elements must be regarded as unfinished implements or tooling accidents.

Finally, the three used projectile heads from Rekem 7, one still having its resin attached, are the longest slender points to have been found at Rekem (58 mm, 58 mm, 45 mm). They might possibly be interpreted as pieces intended for reuse. Two (Pl. 72: 4,5) were found together along the SW edge of the concentration and the third (Pl. 75: 15) in the centre of the area (Map 121).

In summary, the apparent homogeneity of the raw material suggests that many of the elements were obtained from the same nodule. Furthermore, the actual reduction refits, the scantiness of use-wear traces, the numerous remnants of tooling accidents and some tooling refits, all concentrated within a few square meters, make it clear that Rekem 7 and Rekem 11 were specialised areas for the production of blanks and LMP.

6.3.4.2 *Retooling loci: Rekem 5 and Rekem 10*

At least two of the concentrations at Rekem served as "retooling areas"[59] where used arrows had heads and barbs replaced by new LMP. The abundance of non-flint material consignable to structural features, and the relatively large number of tools suggest intensely occupied sites (sections 6.2.6 and 6.2.7). Various activities, including the working of fresh/wet hide, dry hide, and bone/antler, were performed around the hearth zones of these domestic units. LMP represent about one-third of the tools (Table 34).

Local production of LMP can rarely be demonstrated at these loci. The single laterally modified piece refitted in a local reduction sequence at Rekem 5 (co-set 05c03), most likely represents the basal fragment of a broken burin (Pl. 75: 6; see explanation in section 5.2.4.2). The only other LMP united in a dorsal-ventral refit are a pair of unused, virtually entire backed pieces (Pl. 69: 23-24), that may be considered imported elements kept in "reserve" (section 5.2.4.1).

Detailed flint type analysis of the LMP has indicated that about one fifth of these tools (counted after the refitting of fragments) can be associated with local debitage products (24 out of 90 pieces at Rekem 5, 3 out of 41 pieces at Rekem 10; Table 48, codes 1-3). There is only one single manifestly imported element (in flint type 3 at Rekem 5; Table 39, Pl. 69: 11). Yet local production is, in most cases, certainly not proven. The 6 LMP in flint type 5/19 from Rekem 5, for instance, were associated with only one other laminar flake and were, in fact, most likely imported as finished products (Table 161). The same interpretation can be offered for the 4 LMP in flint type 4 from this locus. Furthermore, it is unlikely that the other LMP that are lithologically associated with debitage products reflect an intentional production of LMP blanks. Flint types 5/25 and 10/11 primarily seem to have served for the production of burins, truncated tools, composite tools and borers (see section 4.2.2.2). On the other hand, although the 7 LMP of flint type 5/212 represent the main formal tool class of this flint type, it should be noted that 7 laminar products and 1 truncated tool in this flint type served to cut soft animal matter and carcass. At least a few of them (refitted in co-set 05c09; section 4.4.2.3) are presumably imported. Finally, it remains a possibility that the blanks used for the fabrication of the 4 elements in local flint type 5/11 were actually recycled from a pile of debitage, generated during a previous serial production of scrapers (section 6.3.6.1). Two Krukowski microburins at Rekem 5

[59] Keeley 1982, 799.

Table 161

Origin of blanks of laterally modified laminar pieces by flint type at the various loci of habitation zone 1.

* 1 backed point in the cell of flint type 1/10 refits with a few elements of Rekem 7 (set 07s32).

Legend for origin of blank (figures in cells) :

1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
24. Refitted with other tool only, but debitage waste material of this specific flint type is refitting at the locus.
3. Unrefitted, but member of a specific flint type including non-refitting debitage waste material at the locus.
5. Unrefitted and member of an unspecified flint type.
54. Member of an unspecified flint type refitted in a dorsal-ventral refit lacking debitage (i.e. only with other tools).
6. Unrefitted member of a flint type lacking debitage waste material.
74. Refitted with tools of other locus.

	Locus									
Flint type	1	4	5	6	7	10	11	12	13	16
0	5	-	5	5	5	5	5	5	5	-
10	5,74*	-	5,54	5,54	5,54	-	5	5	-	5
11	-	-	2	2	-	2	-	-	-	-
19	-	-	3	-	-	-	-	-	-	-
20	5	-	5	5	1,5	5	1,5	5	-	-
21	-	-	-	-	1,2,24	-	2	1	-	-
22	-	1	-	-	2	-	-	-	-	-
23	-	-	-	-	-	-	2	-	-	-
24	-	-	1	-	-	-	-	-	-	-
25	1,2,24	-	2	-	-	-	-	-	-	-
29	2	-	-	-	-	-	-	-	-	-
212	-	-	2	-	-	-	-	-	-	-
3	-	6	6	3	-	-	-	-	-	-
4	-	-	3	2	-	-	-	-	-	-

also seem to be of this flint type. On the whole, however, evidence of local tooling is very scarce. Rekem 5 East totals 3 Krukowski mi-croburins, 3 fracture facets with a bulbar zone and 2 fragments with a trihedral point. Most of these pieces seem to be associated with the hearth zone. At Rekem 10, only one Krukowski microburin was found.

In contrast with the production areas, these loci are clearly dominated by slender elements both at Rekem 5 (85 of 97) and at Rekem 10 (40 of 41; Table 38). About two-thirds of the slender pieces (counted after refitting of broken LMP) display micro- or macroscopic traces related to use as projectiles: 48 projectile heads (including 3 former barbs), and 3 barbs (60%) at Rekem 5, and 24 projectile heads and 2 barbs (65%) at Rekem 10 (Table 162).

The retooling areas in these loci are connected with the open air combustion area at Rekem 5 East, and with the habitation at Rekem 10 (Map 123 & 124). The few elements found next to the Western hearth at Rekem 5, *i.e.* 2 used projectile heads, and 1 slender and 3 large unused LMP, are considered isolated. Likewise, the four isolated finds outside the habitation at Rekem 10, *i.e.* 2 projectile heads and 2 unused slender LMP, are not included in the following analysis.

At Rekem 5 East, with regard to the fragmentation of the used projectile heads before refitting and apart from 15 (nearly) complete elements, the scarcity of point fragments (N=7) contrasts with the importance of medial and basal fragments (N=24). A similar situation is observed at Rekem 10, where aside from 3 (nearly) complete elements, 4 point fragments are out-numbered by 15 medial and basal fragments. In contrast to easily lost point fragments, projectile bases remain frequently attached to the shaft (see above), especially when firmly fixed with ligatures. As such, both hearth areas must be interpreted as places where broken projectile head remnants were removed from the shaft and replaced by new missile points. We may suppose that the same hearths also served for melting resin with which to mount these new implements. As they were used away from the site, these new arrowheads are archaeologically invisible. The few traces of tooling at Rekem 5 may still indirectly pay witness to this hafting activity, while some (nearly) complete laterally modified bladelets without diagnostic impact traces may be viewed as a small "reserve" of barbs (see above). A short-distance reduction refit of two of these just outside the fire zone indicates that some of the prepared elements were never inserted into a shaft.

At both hearth areas the spatial distribution of used projectiles appears to be dependent on their dimensions and their states of fragmentation. At Rekem 5 East (Map 123), within the hearth zone, 16 medial and basal fragments clearly outnumber 4 nearly complete specimens. Half of the fragments are short (± 15 mm). Near the fireplace, where heat was needed to soften the adhesive, the fragments still attached to their shafts were squeezed out and dropped nearby. Outside the hearth zone, 11 nearly complete, used projectile heads, outnumber 2 point and 8 basal or medial fragments. Moreover, the fracturing of some of the pieces outside the hearth zone may be ascribed to trampling or to a post-depositional process because fragments that could be refitted at a snap fracture were found next to each other. Counted after refitting, 13 nearly complete projectile heads clearly outnumber the 4 projectile bases, which are rather long (3 of 4 being >25 mm). This inverse ratio (to the situation inside the hearth zone) may reflect the so-called centrifugal effect[60] of discard practices during retooling. Whereas the short basal fragments were dropped on the spot when squeezed out of their shafts, complete specimens and longer fragments were taken out and discarded to a peripheral toss-zone. This process may also explain the peripheral position of long point fragments, with haft-related attributes, and of protruding missile fragments refitting with their bases located inside the hearth zone. In these cases, the protruding fragments must still have adhered to their shafts when the inhabitants came back from the hunt. In summary, the actual spatial position of the used projectile heads is related to the way in which they were removed from the shaft and which in turn depended on their state of fragmentation.

Table 162
Rekem habitation zone 1. Indices of tooling mishaps and use on the slender LMP at the various loci. (counts before refitting of fragments of broken pieces)

	Locus										
	1	4	5	6	7	10	11	12	13	16	Total
Total number	38	2	85	49	19	40	17	29	1	2	282
Projectile head	16	1	45	21	3	24	2	11	-	2	125
Projectile barb	1	-	3	1	-	2	-	2	-	-	9
Barb reused as projectile head	-	-	3	-	-	-	-	-	-	-	3
No diagnostic features	21	1	34	27	16	14	15	16	1	0	145
% with indications of use on projectile	45%	50%	60%	45%	16%	65%	12%	45%	0%	100%	48%
Presence of trihedral point (tooling accident)	5	0	2	0	6	0	1	2	0	0	16

[60] Leroi-Gourhan & Brézillon 1966; Binford 1978; Löhr 1979.

The circular structure at Rekem 10 (Map 124) shows a similar centrifugal effect with regard to the LMP. An accumulation of 8 medial and basal fragments from used projectile heads is found in connection with the small, oval fire-zone. Five of these fragments are very short (± 1 cm) and contrasts with the 7 used basal fragments outside the fire zone. With a general length of between 2.5 and 3.5 cm, the dimensions of the latter resemble the three nearly complete projectile heads, all likewise found outside the fire zone.

In both concentrations, the spatial distribution of pieces without diagnostic impact traces is different to that of the missile fragments. At Rekem 5, almost complete pieces and fragments are found in equal proportion inside (7 vs. 11) and outside (6 vs. 9) the hearth zone. Rekem 10 similarly displays equal proportions: 0 vs. 6 inside and 2 vs. 5 outside the hearth zone. This lack of spatial differentiation may be due to the fact that these undiagnostic pieces actually represent a mixture of tooling discard, of pieces held in supply, and/or of unrecognised missiles. This observation underlines the virtue of a functional analysis in cases where the recognition of spatial patterns is attempted.

Half of the 8 large LMP at Rekem 5 East can be related to the slender ones because of their rather limited dimensions (thin, short, narrow). All lack any traces of use, and may be regarded as discarded slender pieces, as may be suggested by two refitted fragments which show a fracture that had emerged during retouching. One of the two whole large pieces was used as a butchering knife (Pl. 70: 16) just like the single large element at Rekem 10 (Pl. 73: 14).

Rekem 6 and 12, two nearby loci which together with Rekem 5 and 10 form the Western line of habitation zone 1, present some analogy, though not with the same degree of resolution. In fact, partial post-occupational disturbance of these loci may, to some extent, have disordered former patterning (section 6.2.8-9). The location of blank production remains unsettled for the great majority of LMP at both these loci (Tables 39, 48 and 161). Only 1 (atypical) large LMP at Rekem 12 could be refitted in a small local reduction sequence (set 12s38). It was made in flint 12/21, a type otherwise primarily exploited for burin manufacturing (see section 4.2.2.2). The only dorsal-ventral refit with LMP at Rekem 6 joins 2 slender backed pieces in an unspecified fine-grained flint (set 06s68; Pl. 71: 26). The possible manufacture of LMP from local blanks at this locus can only be inferred from the detailed flint type analysis: 1 slender LMP was made in flint type 6/11, which according to occasionally refitting debitage products, seems at least to have been partially knapped at this locus. The same is true for the 5 LMP in flint type 4, whereas the single LMP in flint type 3 is accompanied only by unrefitting debitage waste. Direct evidence for local tooling is completely absent at Rekem 6 and extremely scarce at Rekem 12, where the assemblage contains 4 Krukowski microburins and 2 LMP with trihedral points.

There is a clear predominance of slender elements at Rekem 6 (49 of 54) and at Rekem 12 (29 of 33). At both loci, 45% of these slender pieces display micro- or macroscopic traces related to their use as projectiles: 21 projectile heads and 1 barb at Rekem 6, and 11 projectile heads and 2 barbs at Rekem 12 (Table 162).

Because they lack exact geographical co-ordinates, 9 LMP from Rekem 6 are not plotted on the maps. The large majority of the others were found at the central dense concentration of flint material (Map 125 & Map 8) that partly seems to have functioned as a knapping spot (Map 64; see also section 6.2.8). Whereas this spot contains a mixture of fragments and complete LMP, a concentration of 4 used short basal fragments may also be noted here. The other pieces with diagnostic traces of use comprise mostly point fragments, long basal fragments, and nearly entire missiles and are rather widely scattered in the periphery. Three of them, as well as a burnt fragment, are associated with the possible hearth zone at the Eastern corner of the crescent-like distribution of lithic material at Rekem 6. Finally, a set of two refitting complete backed elements (Pl. 71: 26), 1 other unused slender element, a used projectile head, and a robust 'Creswell' point (Pl. 71: 24) seem to be associated with a small isolated artefact scatter in the NE (corresponding with area A of the scraper distribution; see section 6.3.6.2.1).

At the partially destroyed locus Rekem 12 (see section 6.2.9), the spatial distribution of LMP does not seem to reveal any evident patterning (Map 126). Most of the used LMP are connected with the central oval concentration, but these sparse relics barely allow for a more detailed intra-locus spatial analysis. The N-NE tongue-shaped extension of Rekem 12 contains many LMP (N=9) in proportion to the generally low artefact density in this area; 4 of them were used, one was burnt. As at Rekem 5 and 10, burnt quartz fragments and LMP are again spatially correlated in this zone.

On the whole, although the spatial distribution of LMP at Rekem 6 and Rekem 12 did not preserve any evident patterning, it seems that these loci at least partially attracted retooling activities as well.

Finally, the three sandstone fragments with a central groove, most probably used to straighten and smooth shafts, were also found near these loci. These objects suggest that shafts were manufactured in the vicinity of the retooling areas.

6.3.4.3 Secondary refuse deposit: Rekem 1

Rekem 1 had the densest concentration of LMP (up to 23 within 1 sq m; Map 127). Evidence of refitting and flint type analysis indicates that at least some production of LMP seems to have taken place at this locus (Tables 39, 48 and 161). Three large LMP (including 1 broken piece) could be conjoined into local reduction refits (2 in co-set 01c05, Pl. 24, Pl. 68: 26-27, Map 32; and 1 in set 01s50, Pl. 68: 25), all

in flint type 1/25. One other large LMP and 3 slender items (Pl. 68: 23) are of this same local flint type. In addition, 1 last slender LMP in flint type 1/29, can also be associated with locally refitted debitage products (Pl. 68: 17). All other LMP at Rekem 1 are manufactured in unspecified flint types. Their place of production cannot be ascertained – except for 1 slender backed point that refits with a few artefacts at Rekem 7.

Indices of tooling mishaps and used elements are mixed in equivalent numbers at Rekem 1 (Map 127). Seven Krukowski microburins were recorded, one of which fits onto one of the 5 fragments displaying trihedral points (Pl. 68: 5). Regarding the clearly used missiles, 6 virtually complete pieces, 7 basal fragments, 2 point-fragments, and 1 barb have been recorded. As for 9 larger pieces, both unused fragments without fire cracks manifest snap-fracture facets with a bulbar zone. Moreover, the width of most unused, large pieces (5 of 7) hardly exceeds 12 mm, which make them resemble slender elements. A basal fragment and a (burnt) point-fragment could be refitted.

In summary, its limited area and the lack of a clear hearth zone contrast Rekem 1 with Rekem 5 and 10, whereas its high artefact density and its non-flint rocks differentiate Rekem 1 from Rekem 7 and 11. These facts and the accumulation of morphologically and functionally very distinct tools on a very limited surface, support the hypothesis that Rekem 1 had been at least partially a refuse disposal area[61]. Similar dump zones are known from many Late Palaeolithic sites[62].

Currently, refits of flint artefacts link Rekem 1 with Rekem 16 and, more intensely, with Rekem 7. In fact, since the earlier publication of the LMP analysis[63], several new connections could be physically made between Rekem 7 and Rekem 1, bridging a distance of some 20m. One reduction sequence at Rekem 7 involves, beside 1 LMP, two burins that were found at Rekem 1. At least one of them was intensively used and resharpened (refit with a burin spall). Moreover, a finished backed point (Pl. 68: 1) and two unmodified blades (one also with use-wear traces) from Rekem 1 could also be refitted with reduction sequences at Rekem 7. Conversely, co-set 01c01 from Rekem 1 includes a broken blade that was found at Rekem 7 suggesting that at least some material also moved from Rekem 1 to Rekem 7 (see further details in section 6.2.4).

6.3.4.4 Isolated LMP

The remaining concentrations at habitation zone 1 (Rekem 4, 5 West, 13, 15 & 16), all with low densities of flint, have no (at Rekem 15) or very few LMP

61 Lauwers 1988, 221.
62 Julien 1988.
63 Caspar & De Bie 1996.

Table 163
Rekem habitation zone 1. Archaeological record of intra-settlement arrowhead handling.
(counts before refitting of fragments of broken LMP).
* Excluding heavily burnt pieces.
** Excluding fragments with exclusively thermic fractures.

	Interpretation of locus				
	Production areas		Retooling loci		Dump zone
	Rekem 7	Rekem 11	Rekem 5 East	Rekem 10	Rekem 1
Morphological ratios					
LMP/tools	39/55	29/62	91/272	41/122	48/113
Slender LMP/large LMP	19/20	17/12	82/9	40/1	38/10
Tip fragm./basal fragm. of slender LMP	3/4	6/10	10/41	4/29	11/10
State of preservation on LMP					
Mechanical alteration/LMP	2/39	2/29	21/91	21/41	5/48
Thermal alteration/LMP	9/39	7/29	10/91	5/41	16/48
Functional attributes on slender LMP					
With/without micro-usewear*	3/13	1/10	36/38	9/28	8/19
Diagnostic macro-fract./undiagn. macro-fract.**	3/8	2/11	38/31	24/13	15/12
Indications of tooling					
Krukowski microburins	17	9	3	1	7
LMP with trihedral points	14	5	4	0	7
Refits including LMP					
Reduction sequences	6	2	2	0	4
Resharpenings	5	1	2	0	1
Projectile fractures	0	0	3	0	0
Undiagnostic fractures	0	2	3	0	2
Spatial distribution					
Approx. extent of the concentration	5 sq m	6 sq m	40 sq m	40 sq m	2.5 sq m
Maximum vertical dispersion	48 cm	31 cm	79 cm	63 cm	40 cm
Structural features	Absent	Absent	Hearth zone	Hearth+dwelling	Absent
Distribution of LMP	At random	At random	Centrifugal effect	Centrifugal effect	Very dense

(Map 119). Still, a constant pattern emerges: no large elements appear, while slender pieces are generally isolated. Like the isolated slender pieces near the concentrations we discussed earlier (Rekem 1, 5, 10 & 11), they are chiefly the medial or basal fragments of used missiles. It is clear from the lack of Krukowski microburins and other relevant features that the tooling of LMP did not occur at these concentrations. Only Rekem 5 West included a few isolated unused large LMP and 1 Krukowski microburin. Their relationship with the large eastern concentration at this locus could not be established.

6.3.4.5 Discussion: intra-settlement weapon handling in a Federmesser site

At Rekem the manufacture, repair and discard of projectiles were spatially differentiated in the camp layout. The properties of these different units are summarised in Table 163. This synthesis may be useful for building a model of intra-settlement weapon handling in Late Palaeolithic open air sites.

The material representations of archery technology within the Rekem camp disclose a spatial segregation of the diverse stages of the flow-model for the maintenance of hunting gear.

The manufacture of blanks and the shaping of the back and point-tip are mainly found at "limited use" areas such as Rekem 7 and 11, where the emphasis on handling lithic material did not require constructed hearths[64]. Missile head replacement and maintenance of the arrows are spatially associated with the hearth zones of large domestic units. The large majority of used projectile fragments was located around the hearth zones of Rekem 5 and 10, as well as at Rekem 6 and 12. The significant lack of LMP within the refitted reduction sequences at these zones contrasts strongly with the refit rates of other tool types that were often manufactured, used, and discarded on the same spot. The large number of other tools, especially burins, around the hearths, suggests other activities (see below). The hearth apparently served as an attraction pole for activities related to the processing of various animal substances, both soft (meat, skins in diverse forms) and hard (bone/antler). Evidence of missile-head replacement is thus not isolated but appears within a palimpsest of activities, which reflects either a common social context for different workers (as presumably at Rekem 5), or a succession of activities by a single individual at his or her fireplace (possibly at Rekem 10).

When dimensional attributes were included in the spatial analysis, retooling appeared to have generated a centrifugal effect. Short basal fragments were squeezed out of the shaft adhesive and dropped near the hearth area, while longer specimens were pulled out and thrown away. At other sites, H. Löhr has recorded similar spatial observations[65]. Thus, the topographical location of slender LMP is not only dependent on their place in the production sequence but, for used projectile heads, also on their state of fragmentation.

These results cannot, at present, be compared with those at other sites, because the distribution maps are still too often confined to merely formal tool types, which in our opinion, can scarcely lead to an accurate understanding of the activity areas. On a larger scale, however, some comparisons may be drawn. The small isolated *Federmesser* locus of Niederbieber III, for instance, has also been interpreted as a production site for backed pieces and burins[66]. According to the author, its isolation might be explained by the unpleasant smelling of heated birch pitch, a substance that would have been used as a hafting adhesive[67]. At the Magdalenian site of Pincevent, there is also evidence for the specific production areas of backed bladelets. In this case, however, the author noted that "*considering the polluting character of flint knapping, but also the quietude needed for this kind of work, the question arises, whether or not this isolation of the knappers is tied to a desire to keep the surroundings of the hearths clean, where more diversified activities take place, or whether they were just looking for tranquillity*"[68]. The bladelets in Pincevent were mainly obtained during the final stages of laminar production, whereas the larger blades produced earlier from the same nodules were widely distributed over the camp area. At the Magdalenian site of Champréveyres, on the other hand, backed bladelets were produced from standardised, prepared little cores, each with a diameter of approximately 5cm, that had been introduced as such into the site. Further reduction and production of backed bladelets occurred there in the immediate surroundings of the fireplaces[69].

In all, in addition to the possible explanations suggested above, we believe that the spatial isolation of the LMP production areas deserves further consideration. We will return to this issue in the concluding section on the general camp layout (section 6.4).

6.3.5 Butchering and cutting soft animal matter

The spatial analysis of the activities related to the partitioning of carcass and soft animal matter (meat, tendons, hide,...), is still being studied. In fact, provisional results suggest that this part of the process

64 Given the considerable number of burnt artefacts, it cannot be excluded, however, that small fires existed at these locations.

65 Löhr 1979, 114.

66 According to the author also of scrapers, but this is only based on the presence of '*Kratzerabfall*' (scraper retouch waste; Bolus 1992). We are not completely convinced, however, that such retouch flakes can be easily distinguished from retouch waste generated during edge backing.

67 Bolus 1992, 159. The smell of heated resin, used as an adhesive at Rekem, to our taste is rather pleasant!

68 Bodu 1996, 57.

69 Cattin 1990, 365; Leesch 1997.

Table 164
Rekem habitation zone 1. Edge-damaged artefacts. Microwear traces at the various loci.

	Locus										
	1	5	6	7	8	10	11	12	13	16	Total
Total number	35	107	36	12	4	30	18	38	4	16	300
Total number analysed	35	103	35	12	4	30	17	36	4	16	292
N suited for microwear determination	34	86	18	10	1	16	15	35	4	15	234
N with use wear traces	1	7	1	0	0	0	0	2	0	1	12
% with use wear traces	3%	8%	6%	0%	0%	0%	0%	6%	0%	7%	5%
Action and contact matter:											
Cutting soft animal matter	-	1	-	-	-	-	-	-	-	-	1
Cutting dry hide	-	1	1	-	-	-	-	1	-	1	4
Butchering	-	4	-	-	-	-	-	1	-	-	5
Sawing unspecified hard matter	1	-	-	-	-	-	-	-	-	-	1
Fire-lighter	-	1	-	-	-	-	-	-	-	-	1

was primarily conducted with unmodified blanks. At the time of writing, only edge-damaged pieces (N=292) and blanks included in the refits (N=1064) have been examined for use-wear (Tables 33 and 164). In all, 12 of these pieces served to cut up carcass (N=9; Tables 164 and 165; Pl. 107: 2,4,6,10) or soft animal matter (N=3; Pl. 107: 3).

As for the formal tools, these traces were mainly observed on large LMP (N=6; Table 166; Pl. 70: 16, Pl. 73: 14,18,22) and on (obliquely) truncated tools (N=3; Table 168; Pl. 100: 19, Pl. 101: 1). Actually, the distinction between both tool types seems sometimes rather arbitrary. In addition, occasional traces of these activities have also been observed on scrapers (N=2; Pl. 94: 19, Pl. 98: 11), and burins (N=3; Pl. 72: 18, Pl. 76: 13).

Traces of butchering and the cutting of soft animal matter have been registered on isolated pieces at nearly all of the loci of habitation zone 1 (Rekem 1, 7, 10, 11, 12 & 16) but especially at the large open air work area of Rekem 5 (N=10) and its neighbouring locus of Rekem 6 (N=6). More detailed intra-locus spatial analyses of these activities will only be useful when the use-wear results of unmodified non-refitted blanks can be integrated. The fact that they cannot be refitted might point at extra-local production and a higher mobility for these pieces, possibly due to their selection for use.

Moreover, it remains a possibility that butchering was largely performed outside the settlement, leading to the removal of projectile points from the carcass. In fact, it was noted earlier that relatively few

Table 165
Rekem habitation zone 1. Traces of utilisation on unmodified refitted artefacts at the various loci (edge-damaged pieces excluded).

	Locus											
	1	4	5	6	7	10	11	12	13	15	16	Total
Total number	212	48	551	201	101	186	103	139	49	63	162	1815
Total number analysed	156	22	329	123	60	118	42	100	24	22	86	1082
N suited for microwear determination	155	22	319	119	59	65	42	100	24	21	86	1012
N with usewear traces	0	0	7	3	0	2	0	2	0	0	1	15
% with usewear traces	0%	0%	2%	3%	0%	3%	0%	2%	0%	0%	1%	1%
Action and contact matter:												
Butchering	-	-	2	1	-	-	-	-	-	-	-	3
Cutting soft animal matter	-	-	1	1	-	-	-	-	-	-	-	2
Scraping hide	-	-	-	1	-	-	-	-	-	-	-	1
Cutting hide	-	-	1	-	-	-	-	2	-	-	-	3
Sawing bone/antler	-	-	2	-	-	1	-	-	-	-	-	3
Butchering + sawing bone/antler	-	-	-	-	-	1	-	-	-	-	-	1
Sawing wood	-	-	-	-	-	-	-	-	-	-	1	1
Fire-lighter	-	-	1	-	-	-	-	-	-	-	-	1

Table 167
Origin of blanks of truncated tools by flint type at the various loci of habitation zone 1.
Legend for origin of blank (figures in cells) :
1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
24. Refitted with other tool only, but debitage waste material of this specific flint type is refitting at the locus.
3. Unrefitted, but member of a specific flint type including non-refitting debitage waste material at the locus.
5. Unrefitted and member of an unspecified flint type.
6. Unrefitted member of a flint type lacking debitage waste material.

	Locus								
Flint type	1	4	5	6	7	10	11	12	16
10	5	-	-	5	5	-	-	-	5
11	-	-	-	-	-	2	2	-	-
14	-	-	-	-	-	6	-	-	-
20	5	5	5	5	5	5	-	5	5
21	-	-	1	-	2,24	-	-	-	-
22	-	-	-	2	2	-	-	-	-
23	-	-	-	-	-	-	2	-	-
24	-	-	1	-	-	-	-	-	-
25	24	-	1,2	-	-	-	-	-	-
27	1,2	-	-	-	-	-	-	-	-
28	1	-	-	-	-	-	-	-	-
210	-	-	2	-	-	-	-	-	-
212	-	-	1	-	-	-	-	-	-
3	-	-	-	3	-	-	-	-	-

Table 166
Rekem habitation zone 1. Traces of tooling mishaps and utilisation on the large LMP at the various loci. (counts before refitting of fragments of broken pieces)

	Locus							Total
	1	5	6	7	10	11	12	
Total number	10	12	5	20	1	12	4	64
N suited for microwear determination	6	12	5	16	1	11	4	55
N with usewear traces	0	1	0	1	1	3	0	6
% with usewear	0%	8%	0%	6%	100%	27%	0%	11%
Action and contact matter of I.U.Z.								
Butchering	-	1	-	1	1	3	-	6
Macroscopic observations								
Presence of trihedral point and/or bulbar snap fracture (tooling accident)	2	2	-	8	-	4	-	16

point tips seem to have entered the dwelling with the game kills[70]. In ethno-archaeological contexts, primary butchering is also often recorded on the outskirts of the habitation zone[71]. Such a procedure would leave very little tangible evidence.

Finally, whether or not the presence of cutting traces on some large slabs near the hearth at Rekem 5 East (Pl. 3: 4) and at Rekem 6 can be related to the cutting of meat or other substances (*e.g.* hide) cannot be established. On the other hand, the heating of such large slabs may have played a role in food preparation, though alternative techniques are also feasible[72].

Table 168
Rekem habitation zone 1. Truncated tools. Microwear traces of utilisation and macroscopic interpretation of some implements at the various loci.

	Locus									Total
	1	4	5	6	7	10	11	12	16	
Total number	21	2	10	16	7	7	3	2	5	73
N suited for microwear determination	18	1	9	14	6	4	3	2	5	62
N with use wear traces	1	0	3	3	0	0	0	0	0	7
% with use wear traces	6%	0%	33%	21%	0%	0%	0%	0%	0%	11%
Microscopic use wear traces: action and contact matter:										
Cutting soft animal matter	-	-	-	1	-	-	-	-	-	1
Cutting dry hide	-	-	-	1	-	-	-	-	-	1
Sawing bone/antler	-	-	1	-	-	-	-	-	-	1
Butchering	-	-	1	1	-	-	-	-	-	2
Boring unspecified hard matter	-	-	1	-	-	-	-	-	-	1
Projectile point	1	-	-	-	-	-	-	-	-	1
Macroscopic interpretation of some other truncated tools:										
Used projectile	-	-	-	1	-	-	-	-	-	1
Unfinished backed point	-	-	1	-	4	-	-	-	-	5
Discarded burin	-	1	1	1	-	-	-	-	1	4
Discarded scraper	-	-	-	3	1	-	-	-	-	4
Boring implement	-	-	-	-	-	1	-	-	-	1

[70] Caspar & De Bie 1996.
[71] Among the Efe Pygmies, '*butchering an animal in camp is done near the camp periphery and away from huts, presumably because of disagreeable odours and by-products*' (Fisher & Strickland 1991,222).
[72] The Dene, for instance, use 'cooking sticks', i.e. green sticks, usually of willow, sharpened on both ends. One end is shoved into the ground near the fire, and meat or fish is impaled on the other (Janes 1989).

Table 169
Rekem habitation zone 1. Traces of utilisation on the scrapers at the various loci.

	Locus										
	1	4	5	6	7	8	10	11	12	16	Total
Total number	10	1	58	41	5	3	6	7	19	12	162
N suited for microwear determination	9	1	57	30	3	1	5	6	17	8	137
N with use wear traces	6	0	48	21	2	1	4	1	6	4	93
% with use wear traces	67%	0%	84%	70%	67%	100%	80%	17%	35%	50%	68%
Total N of I.U.Z.	6	0	53	24	2	1	5	1	7	4	103
Action and contact matter of I.U.Z.											
Scraping wood	-	-	-	5	-	-	-	-	-	-	5
Sawing wood	-	-	-	-	-	-	-	-	-	1	1
Scraping fresh/wet hide	-	-	13	1	1	-	-	-	1	2	18
Scraping dry hide	6	-	31	12	1	1	4	1	4	-	60
Cutting dry hide	-	-	-	1	-	-	-	-	1	-	2
Scraping supple dry hide	-	-	5	-	-	-	1	-	-	-	6
Scraping hide in an indeterm. state	-	-	2	1	-	-	-	-	-	-	3
Scraping bone/antler	-	-	-	2	-	-	-	-	-	-	2
Sawing bone/antler	-	-	-	1	-	-	-	-	1	-	2
Scraping bone	-	-	2	-	-	-	-	-	-	-	2
Butchering	-	-	-	1	-	-	-	-	-	1	2

6.3.6 Scraper manufacture and hide processing

Extensive morpho-technical, lithological, refitting, functional, and spatial analyses of the end scrapers (Map 128-130) revealed specific characteristics of this assemblage related to the production of the tools, the cycles of shaping, use, resharpening and reuse of pieces almost systematically associated with hide scraping, and finally, to causes of discard. At a spatial level, well-defined activity areas of fresh or wet (fleshing, dehairing,...) and dry hide working could be distinguished. This division of space with regard to the various hide-working episodes was especially apparent at the large central open-air work area of Rekem 5. An overview of the use-wear results related to the scrapers by locus is provided in Table 169.

6.3.6.1 Fleshing, dehairing, and dry hide scraping at Rekem 5

This locus contains the highest number of scrapers (N=58), with a use-rate of 84% (Table 169) and almost exclusively related to scraping activities. The mean number of IUZ per scraper is 1.1. The scraping edges worked dry hide (31 IUZ), fresh/wet hide (13 IUZ) or a hide of which the state remains undetermined (2 IUZ); only 2 scraping edges served to scrape bone or antler. Finally, 5 lateral edges show microwear traces of a transverse contact on supple (dry) hide (leather?).

20 scrapers (34%) could be refitted: 15 into reduction sequences, 3 to a broken part of their blank, and 2 in both these refit types. Dorsal-ventral refitting and flint type analysis show that the great majority of the scraper blanks were produced locally (N= 40; Table 111, codes 1 & 2). That is, all items in specified fine- and coarse-grained flint types (Tables 87 and 170), as well as a few refitted pieces in unspecified type 5/20. More than half of the scrapers (19 of 33) in coarse-grained flint are of flint type 5/21; 7 of these are refitted into reduction sequences (co-sets 05c01, 05c08, 05c14, 05s061). The 14 others are in flint types 5/22 (N=3), 5/23 (N=1) or 5/20 (N= 10). Six are refitted into reduction sequences, 2 of flint type 5/22 (set 05s095), 1 of flint type 5/23 (co-set 05c05), and 3 of flint type 5/20 (sets 05s054, 05s056[73], 05s090). 14 of the 22 fine-grained scrapers are manufactured in local flint type 5/11. Four of these are included in reduction sequences (co-set 05c13 and sets 05s039 & 05s091). The production of blanks for the 8 scrapers in unspecified fine-grained flint (type 5/10) could not be located. Two scrapers, finally, are manufactured in extra-local flint types 3 and 5.

Map 131 shows the distribution of all the artefacts in flint types related to scrapers. At Rekem 5 East, where the large majority of the scrapers were found, a neat spatial separation can be observed between, on the one hand, specified coarse-grained flint types 5/21, 5/22 and 5/23, situated in the Eastern part (zone I, largely E/SE of the pentagonal hearth zone described in section 6.2.7.3) and on the other hand, fine-grained flint type 5/11, located in the Western part (zone II, essentially in and NE of the hearth zone). The distribution of scrapers in those flint types also reflects this dichotomy[74] (Map 132). Finally, the scrapers at Rekem 5 West – mostly in

[73] In this case, the scraper found at Rekem 5 (Pl. 2: 13) refits onto a crested blade excavated at Rekem 6. The origin of its blank may be rather sub-local.

[74] Two scrapers in flint type 5/21, used on fresh/wet (Pl. 93: 7), and half-dry hide (Pl. 94: 10), are not shown on the map by lack of their exact co-ordinates, but they presumably belong with zone I.

unspecified flint types – are found next to the hearth or widely dispersed in its periphery.

The two zones at Rekem 5 East largely correspond with spatially distinct areas where different stages of hide working activities took place, ranging from the fleshing and dehairing of hide, to currying (dry hide working). The spatial organisation, i.e. the arrangement of the worked material and the location of the manufacture and maintenance of the scrapers utilised in those various operations, varied according to the physical state of the hides at the moment they were being worked.

6.3.6.1.1. Hide fleshing and dehairing: zone I

Zone I apparently served as a hide fleshing and/or dehairing area, where grease, animal tissue, or hair still adhering to the hide was removed by scraping.

The use-rate of the scrapers in this zone is extremely high. Of 30 scrapers, only 5 pieces are lacking microscopic traces of use on the scraper-head (Table 171; Pl. 92: 12,14, Pl. 94: 3,14); one of these presents traces of supple (dry) hide scraping on a lateral edge. Except for the scraper in flint type 5/23, used to scrape bone[75] (Pl. 94: 16), all used scraper-heads from this area served to scrape hide, either in a fresh/wet state (N=9; Pl. 91: 15, Pl. 92: 4,7, Pl. 93: 3,11,17, Pl. 94: 2), half-dry (N=5; Pl. 91: 13, Pl. 92: 02, Pl. 93: 19, Pl. 94: 4,11), dry (N=9; Pl. 91: 13, Pl. 94: 11), or undetermined (N=1; Pl. 93: 4); one of the items that served to scrape dry hide with its front, was equally used to scrape supple (dry) hide with a lateral edge (Pl. 93: 15).

Fresh/wet hide scraping was primarily observed on scrapers in local flint types 5/21 and 5/22 (N=7; Table 171) but also on 2 scrapers in flint type 5/20. A few other scrapers in these flint types had been used to scrape a dry hide that in several cases still seemed to have preserved a certain degree of humidity (slightly greased or wet). It is possible that these tools actually participated in the same activity, as hides may quickly loose their humidity under certain conditions (*e.g.* next to a hearth). The initial scraping of a fresh hide may thus gradually develop into the scraping of a hide in an advancing state of dryness[76]. Conversely, the used scrapers in fine-grained flint types 5/10 and 5/11 in zone I were exclusively used on dry hide. However, the specimen in the latter flint type is linked by a dorsal-ventral refit (set 05s091) with a scraper from area A in the neighbouring zone II (see below).

The position of the use-wear traces on the scrapers in flint types 5/20-22, either symmetrical or inclined on the right side of the scraper-head, presumably reflects the separated positions of the hands on the haft (section 5.4.2.2), as observed by Beyries[77] with regard to hafted scrapers in Canada, used on hides stretched in a (sub)vertical frame. More detailed analyses are presently being prepared in collaboration with S. Beyries and should lead to a more precise interpretation of the microscopic traces observed on the Rekem scrapers by comparison with the traces on ethnographic examples.

Table 170
Origin of scraper blanks by flint types at the various loci of habitation zone 1.
* 1 scraper in the cell of flint type 6/11 refits with a burin of Rekem 5 (set 05s063).
Legend for origin of blank (figures in cells) :
1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
3. Unrefitted, but member of a specific flint type including non-refitting debitage waste material at the locus.
5. Unrefitted and member of an unspecified flint type.
54. Member of an unspecified flint type refitted in a dorsal-ventral refit lacking debitage (i.e. only with other tools).
6. Unrefitted member of a flint type lacking debitage waste material.
74. Refitted with tool of other locus.

	Locus									
Flint type	1	4	5	6	7	8	10	11	12	16
0	-	-	5	5	5	-	5	5	-	5
10	5	5	5	5	-	5	-	5	-	5
11	-	-	1,2	2,74*	-	-	-	-	2	-
12	-	-	-	-	-	-	-	-	2	-
20	5	-	1,5	1,5	5	5	5,54	5	5	5
21	-	-	1,2	-	2	-	-	-	-	-
22	-	-	1,2	-	2	-	-	-	-	-
23	-	-	1	-	-	-	-	2	1,2	1
24	-	-	-	-	-	-	-	-	1,2	1,2
25	-	-	-	-	-	-	6	-	6	-
26	-	-	-	-	-	-	6	-	-	-
27	2	-	-	-	-	-	-	-	-	-
3	-	-	6	3	-	-	-	-	-	-
5	-	-	6	-	-	-	-	-	-	-

At zone I, the scrapers in flint types 5/20-22 were mixed with their production waste. The scraper assemblage includes exhausted pieces as well as tools abandoned after failed resharpening, after breakage during use, or in a still functional state. The scraping edges used on hide are perfectly regularised in 17 cases; the 3 other used scraper-heads are denticaluted on their entire front[78] (Pl. 93: 11) or present a pronounced overhang (Pl. 93: 19) or a notch (Pl. 93: 15). The fronts of the 4 unused pieces display a pronounced overhang (N=2; Pl. 92: 12), indentations (N=1; Pl. 92: 14) or both features (N=1; Pl. 94: 14), generated either during their initial manufacture or

[75] This scraper, refitted with several burins and a burin-scraper in co-set 05c05, did clearly not participate in hide working activities, and will be treated in section 6.3.7.5.1 on the spatial analysis of the burins.

[76] Gassin 1996, 156.

[77] Beyries 1997.

[78] However, these denticulations do not seem to be the result of a failed resharpening attempt. In fact, for hide fleshing, as in this case, "*a scraper with a sharp and irregular or finely denticulate edge is quite suitable because the projections catch and pull away the softer tissue*" (Keeley 1978, 75).

during (failed) resharpening attempts leading to their discard. The latter phenomenon could certainly be attested on 1 scraper-head used on dry hide (Pl. 93: 15). Retouch in its central concavity removed part of the micropolish. Only 2 dry hide scrapers, with a direct fracture at 24 mm (Pl. 94: 13) and at 26 mm (Pl. 94: 11) from their fronts, suffered from breakage during use. Their length is extremely variable (*i.e.* between 16 mm and 71 mm). Six scrapers, with a length <27mm, reached their point of maximum reduction before their abandonment (fig. 74). The shortness of these elements and their proven uses implicates the employment of a haft.

Finally, it may be mentioned that zone I also includes an unmodified blank, subsequently transformed into a burin (Pl. 78: 10) and used in both states to cut fresh/wet hide successively in a low and a high working angle. It refits in co-set 05c14 (flint type 5/21), a sequence which generated a series of scrapers used for hide fleshing. It is possible that this piece served as a knife with which to remove non-usable extremities (paws, tail,...) from the hide, and as a burin to create small eyelet-holes designed to fix the hide into a frame.

6.3.6.1.2 Dry hide work: zone II

As mentioned above, zone II is largely dominated by scrapers in fine-grained flint type 5/11. The three isolated exceptions are unused scrapers in flint type 3 (Pl. 93: 10) and 5/20 (Pl. 92: 01) and one hide-fleshing scraper in flint 5/21 (Pl. 94: 5). The latter, clearly derives from zone I, at a distance of 2.5m, whereas the isolated scraper in the North, in flint type 5/20 (Pl. 92: 1), refits with a flake from zone III (set 05s056).

The scrapers in flint type 5/11 are essentially distributed in 2 areas. Area A, in the S part, coincides with the pentagonal dispersion of burnt rocks and contains 5 scrapers (Pl. 92: 9,15, Pl. 93: 5,13, Pl. 94: 9) that are mixed with the debitage waste from their blank production. Area B, NW of the pentagonal hearth zone, contains 8 scrapers (Pl. 91: 14, Pl. 92: 6,11, Pl. 93: 6,9, 14,16) that seem to delimit an oval 'empty' space of some 5 sq m.

Except for one piece with insufficiently developed use-wear to allow the recognition of the state of the hide, all scrapers from both areas A and B are homogeneously determined as dry hide scrapers (Table 171). In one case, the microwear polish was interrupted by resharpening removals which prohibited the determination of the state of the hide. Hafting traces have been attested on 2 specimens (Pl. 91: 14, Pl. 93: 6). These traces are characterised by 3 direct fractures less than 35 mm from the scraping front (Pl. 92: 9,11, Pl. 94: 9) and hafting is also suggested by the extremely limited dimensions (<25 mm) of 3 of the 10 complete specimens of this series (Pl. 92: 15, Pl. 93: 13,14).

The detailed analysis of the scrapers allows for a reconstruction of the distinctive behaviour within these areas. At area A, corresponding with the place of blank production and the manufacturing of the scrapers (cf. refits), indications of resharpening can be found, as well as exhausted tools which potentially had been dehafted here. Three pieces with an irregular scraping edge, *i.e.* with a pronounced overhang (Pl. 92: 9), a partial fracture (Pl. 94: 9), or a gibbosity (Pl. 93: 13), show traces of resharpening attempts that in two cases partially destroyed the former use-wear polish. Presumably, this activity also destroyed the 2 scrapers that broke near the end of the haft, at some 18 to 19 mm from the scraping edge. The latter has been refitted to its fragment (set 05s092; Pl. 92: 9). The 2 other specimens from area A, both with a regular front, are rather small (Pl. 92: 15, Pl. 93: 5). Repeated rejuvenation cycles of the

Table 171

Rekem 5. Scrapers. Worked substance on scraperhead(s) at the various activity zones by flint type and origin of blank.

* double scraper with 2 used scraperheads.

Legend for origin of blank:

1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
5. Unrefitted and member of an unspecified flint type.
6. Unrefitted member of a flint type lacking debitage waste material.

		Zone I						Zone II				Zone III				Total
Flint type	Origin of blank	No traces	Indet. hide	Fresh/ wet hide	Half-dry hide	Dry hide	Bone	No traces	Indet. hide	Fresh/ wet hide	Dry hide	No traces	Fresh/ wet hide	Dry hide	Bone	
5/21-23	1,2	3	1	7	5	2	1	-	-	1	-	-	1*	-	-	21
5/20	5	1	-	2	-	3	-	1	-	-	-	2	-	-	1	10
5/11	1,2	-	-	-	-	1	-	-	1	-	12	-	-	-	-	14
5/10 & 0	5	-	-	-	-	3	-	-	-	-	-	2	-	4	-	9
3 & 5	6	1	-	-	-	-	-	1	-	-	-	-	-	-	-	2
Total		5	1	9	5	9	1	2	1	1	12	4	1	4	1	56

scraping edges seems to have reduced the lengths of these pieces beneath the reduction limit of 2.0 cm to 2.5 cm which appears to be size at which these tools were abandoned at Rekem (cf. fig. 74).

The open oval-shaped space bordered with scrapers (area B) may well represent the location where the dry hide was spread out on the soil and was being worked with scrapers, some of which were abandoned before they were exhausted. In fact, a well-defined techno-functional reason for the abandonment of any of the tools at this area cannot be identified, except perhaps for one scraper that seemingly broke during use (it has a direct fracture at 26 mm from its 'regular' front; Pl. 92: 11). The length of the 'complete' scrapers is almost systematically more than 1cm above the 'reduction limit' of 22mm (fig. 74). Their scraping edges are regularised; the small overhangs on 3 of these fronts cannot have hampered further rejuvenation. The non-exhausted use-life potential of 3 to 5 resharpening rounds per piece (estimation calculated on a mean loss of 2mm to 3mm length during each rejuvenation), suggests that the real cause of their abandonment may well have been the accomplishment of the task.

It can be suggested that this spatial subdivision possibly reflects the concern of the hide workers to prevent the activity area from being contaminated by any form of flint waste (*e.g.* retouch flakes) that could have damaged the hide laid flat during scraping. Therefore, a short displacement of the scrapers to a separate area seems to have taken place for the various rejuvenations. (De-)hafting apparently does not play a major role in this scenario, as it could occur at either of the areas. Exhausted elements may have been dehafted at the production area (A) prior to being replaced by another scraper, while other tools were seemingly dehafted at the 'activity area' (B) once the task accomplished.

The 'virgin' zone of area (B), NW of the combustion area, presumably corresponds with the working of a dry hide, spread out on the soil. The interior 5 sq m oval-shaped surface suggests the working of a large hide (moose, aurochs, red deer,...?). The abandonment of the scrapers while still functional at the activity area proper with, moreover, a considerable use-potential on 5 of the 8 pieces around the oval, possibly implies that the activity was executed by 5 persons. In fact, it seems rather unlikely that an artisan would have abandoned more than one tool in a still functional state.

6.3.6.1.3. Zone III (Rekem 5 West)

The spatial patterning of the scrapers in zone III does not seem to reflect a similar scenario. In fact, their position next to the hearth and in the wider periphery of Rekem 5 West possibly results from a centrifugal effect (section 6.2.7.4). The 10 scrapers in this area are mainly manufactured in unspecified flint types 0 (N=1), 5/10 (N=5), and 5/20 (N=3). The single piece in flint type 5/21 is a double scraper, intensively used on fresh/wet hide (Pl. 94: 1), that obviously originated from zone I. The other pieces were used on dry hide (N=4; Pl. 92: 5,10, Pl. 93: 18, Pl. 94: 15) or bone (N=1; Pl. 92: 13), 3 pieces do not bear any traces of use (Pl. 94: 6,7) and the final item was too heavily altered for use-wear determination.

The zone III tools in flint type 5/10 are characterised by an irregular scraping edge with the exception of one piece which was found near area B. The fronts of two items have been partially subjected to a resharpening attempt, which had obliterated the use-wear traces generated during a former use episode. One complete scraper had additionally been used to scrape supple hide with both its lateral edges and with its dorsal ridge (Pl. 92: 5). The other item was broken in the course of rejuvenation (Pl. 92: 10) and could be refitted to its proximal fragment nearby, which on the upper parts of its topography (such as dorsal ridges and the bulbar area), shows positive traces of friction against a haft. The specimen with a regular scraping edge used on dry hide and found at 1.5m SW of area B, is clearly exhausted (L=23 mm; Pl. 93: 18). It may possibly be associated with the exhausted items of flint type 5/11.

At Rekem 5 West, both unused scrapers in flint type 5/20 were probably broken during a (re)sharpening attempt (Pl. 94: 6,7). Their scraping edges are very irregular, both displaying small indentations. Moreover, one of the fronts has a rectilinear outline. A third specimen (Pl. 92: 13), found at the S edge of the hearth of zone III presumably broke when being used as a bone scraper. Its refitting with a blank from Rekem 6 emphasises its extra-local manufacturing and (possibly) use; in fact, at Rekem 6, two other scrapers also served to scrape bone or antler.

6.3.6.2 A variety of uses at Rekem 6 and Rekem 16

6.3.6.2.1. Rekem 6

The tool kit from this locus includes 41 scrapers (23%; Table 34). The place of production of the 5 items altered by fire (Pl. 95: 4,10,11) and of the scrapers in unspecified flint types 6/10 (N=14) and 6/20 (N=18), cannot be established, except perhaps for 1 specimen (Pl. 95: 5) that seems to have resulted from a local reduction since it refits in a small set (06s52; Tables 87, 111 and 170). The production of the 2 scrapers (Pl. 98: 14) manufactured in flint type 6/11, identical with type 5/11 of Rekem 5, was seemingly (sub-)local. One of these (Pl. 94: 17) refits with a burin found at Rekem 5 (Pl. 79: 6). Finally, the two implements in flint type 3 (Pl. 95: 2, Pl. 98: 15) are accompanied by identical debitage waste.

30 individually plotted scrapers from Rekem 6 were subjected to a detailed spatial analysis (Map 128). Three of these, found isolated in the 'circulation zone' West of the concentration, are discussed below (section 6.3.6.5). The others are essentially distributed in three areas (Map 130).

The first area (A), in the NE sector (squares N6-7E8-10), is characterised by a low artefact density and is completely devoid of artefacts in sandstone or quartzite. Seven scrapers were found here. Three of these were heavily altered by fire, while only 1 of the 4 non-altered pieces produced traces of dry hide working on its scraping edge (Pl. 98: 13). Together, these pieces delimit an oval area of some 3 sq m. In contrast to area B at Rekem 5, the raw material of the scrapers from Rekem 6 suggests that they had been obtained from at least four different nodules. It should be stipulated, however, that one of these was in flint type 6/11, identical to flint type 5/11 from zone II at Rekem 5. The scraper-heads and scraping edge cuts are regular on the specimen that bears traces of dry hide working as well as on a burnt piece, but they are characterised by (a combination of) a profound concavity in the centre of the scraping edge outline (N=2; Pl. 95: 6), a pronounced overhang (N=2; Pl. 98: 17), or fine indentations (N=2; Pl. 98: 14). The scraper-heads of 2 scrapers were destroyed by thermic cupules (Pl. 95: 10,11).

The second area (B) occupies the central part of the concentration and corresponds with the greatest artefact density and the best refit results from Rekem 6 (Map 64). It also contains a large number of burnt and unburned sandstone fragments (Map 18). Of the 12 scrapers found in this area, one third is too heavily altered by fire (N=1; Pl. 95: 4) or by mechanical action (N=3; Pl. 95: 2,8) for the diagnosis of possible use-wear traces. The 8 other scrapers are either lacking traces of use (N=3; Pl. 94: 20, 95.5) or carry a polish caused by dry hide scraping (N=3; Pl. 94: 17) or, seemingly, by wood scraping (N=2; Pl. 98: 24). All the used scraper-heads are regular, and present a neatly regularised scraping edge cut. With the exception of 2 altered pieces, one having a regularised scraping edge cut, the other being heavily damaged by thermic action, these unused scrapers present irregularities such as fine indentations (N=2; Pl. 95: 5; combined with a small concavity for one of these), a crushed edge (N=1; Pl. 94: 20), a small concavity in the central part (N=1; Pl. 95: 2), and a denticulated edge (N=1; Pl. 95: 8). Two scrapers, one devoid of use-wear and the other having possibly been used on wood, are broken at less than 35 mm from the scraping edge in a direct fracture.

The third area (C), in the SW part, occupies a large surface with a low artefact density, including widely dispersed sandstone objects. Only a few elements could be refitted. This assemblage includes 11 scrapers. One of these is too heavily burnt, 2 pieces were seemingly not used (Pl. 95: 1), and 8 others present use-wear on their scraping edge. This use-wear results from contact with a range of materials: fresh/wet hide (N=1), dry hide (N=3; Pl. 94: 18, Pl. 98: 18), bone (N=2; Pl. 98: 15), and presumably wood (N=2; Pl. 95: 7). One of those, a quite large scraper (L=99 mm; Pl. 95: 7), is also associated with a small zone of "heavy-duty tools" in sandstone and quartzite. All regular scraper-heads with adjusted scraping edge cuts exhibit use-wear. The scraping edge cuts of 2 unused specimens present fine indentations, and one of these also has a small concavity in its outline (Pl. 95: 2). Both these pieces present direct fractures at 19 or 26 mm from the scraping edge, presumably caused in the course of resharpening.

6.3.6.2.2. Rekem 16

This small locus includes a debitage scatter in the NW area and a less densely populated zone in the SE corner containing the 11 scrapers from this locus. One scraper was isolated to the SE of the concentration and is treated below, together with the other pieces found in the 'circulation zones' (section 6.3.6.5). Four scrapers seem to have been produced locally in the SE area, independent of the debitage scatter (Map 128): 1 scraper (Pl. 98: 10) in flint type 16/23, refitting in set 16s24, and 3 other pieces (Pl. 98: 3,4,7), in flint type 16/24 (Tables 87, 111 and 170). The production place of the other scrapers is unknown. These comprise 3 (including 1 burnt piece; Pl. 98: 2) in coarse-grained flint type 16/20 (Pl. 98: 1[79],11), 2 in fine-grained flint 16/10 (Pl. 98: 6,8), and 2 heavily burnt pieces (Pl. 98: 9,12).

The 3 burnt scrapers were not suitable for the determination of microwear. Of the other elements, 4 are lacking use-wear traces (Pl. 98: 3,7,8, 10), 2 served to scrape fresh/wet hide with their scraping edge (Pl. 98: 4,6) and 2 were utilised with a lateral edge to saw wood (Pl. 98: 1) or for butchering (Pl. 98: 11). The unused scraper-heads of the 2 latter pieces are clearly manufactured after the utilisation of the lateral edges.

3 pieces show a transverse fracture opposite their scraper-head. For the scraper used to saw wood (Pl. 98: 1), the fracture, situated at the centre of the tool, 46 mm from the scraper-head, has been induced by accidental or voluntary pressure on the right lateral edge. For the 2 other broken scrapers, the fractures at 18 mm and 22 mm from the scraping edge (Pl. 98: 11,12) are direct and probably due to the (re)-sharpening of the tools while still in their haft. This fracture also interrupts the polish on the lateral edge of specimen Pl. 98: 11, used as butchering knife.

On a spatial level (Map 128 & 130), most of the scrapers (N=7) are situated in a small area of about 2 sq m, corresponding with a burin resharpening area (Map 134). The 4 others are isolated from this area at some 2m or 3m to the S-SE. Both these areas include a scraper that had been used on fresh/wet hide and a piece that had been used, with a lateral edge, on wood (for the area with 7 scrapers) or on carcass in the peripheral sector to the S-SE.

At Rekem 16, as at zone II of Rekem 5, small exhausted specimens (Pl. 98: 3,4,10) and pieces that had broken in the course of resharpening (Pl. 98: 11,12) are mixed with scrapers that had been abandoned at a moment when their length was still exploitable (Pl. 98: 1,2,6-8). The latter artefacts have fine indentations on the scraping edge outline. These are not necessarily inopportune in case of fresh/wet

[79] This piece was found on the northern extremity of the primary scraper area, but could be refitted with its proximal fragment situated in the centre of this area.

hide working and they do not constitute an irregularity that would have impeded the continuation of 'retooling-reuse' cycles.

There is no proof that all these scrapers were employed in the single task of fresh/wet hide working, especially the 2 pieces used with their lateral edge before the installation of their scraper-head, one as butchering knife, the other to saw wood. As a matter of fact, these elements were possibly used in connection with skinning, as a dismembering knife, or in the working of vegetable matter needed to stretch the hide (frame, vegetal bonding,...). Finally, if the 3 burnt scrapers found within 0.5 sq m and inside the principal area containing 7 scrapers do approximately correspond with the location of a hearth, then the fleshing activity might be located, as at Rekem 5, to the SE of this fireplace.

6.3.6.3 Scrapers at and near small knapping posts

6.3.6.3.1 Rekem 7

Mainly engaged in the production of LMP, this knapping station also accommodated a small number of other tool types, including 5 scrapers (Table 34). Three of these (Pl. 95: 14,15,17) are manufactured on locally made blanks (2 in flint type 7/21 and 1 in type 7/22; Tables 87, 111 and 170; Map 128 & Map 130). Both these flint types were reduced for LMP fabrication in this locus and the blanks may have been recycled into scrapers. One of these scrapers (Pl. 95: 15), 22 mm long and lacking use-wear traces, has a scraping edge with fine indentations. It seems to have been abandoned after a final attempt at modification. The 2 others, with a regular scraping edge, were used on fresh/wet hide (Pl. 95: 17) or possibly on dry hide (Pl. 95: 14) although it remains a possibility that the latter traces are more likely to be the result of a mechanical alteration. With a length of respectively 43 and 41 mm, these pieces were clearly abandoned before exhaustion.

A 4th scraper (Pl. 95: 16), located 1.5m NE of the scatter, was manufactured in flint type 7/20. A weak mechanical alteration on this piece reduced the potential for its microscopic examination. The fine indentations on the scraping edge outline and the direct transverse fracture at 14 mm from the front suggest an accidental fracture that occurred during a possible (re)sharpening phase.

The last scraper (Pl. 95: 13), isolated 3m W of the concentration, is burnt. It was formed in a fine-grained flint type, apparently alien to the raw material of the concentration. It seems therefore to be associated with the few dispersed pieces found in the 'circulation zones' (see section 6.3.6.5) rather than with Rekem 7.

The spatial distribution of the few scrapers from Rekem 7, together with the blanks of their production and abandoned before (N=2) or after exhaustion (N=2; including a tool broken in the course of resharpening), is reminiscent of the scraper distribution in Zone I at Rekem 5 where they were intended for fresh/wet hide working. This is the only activity that could be diagnosed with certainty on one of the scrapers of Rekem 7.

6.3.6.3.2 Rekem 11

At Rekem 11 (Map 128 & Map 130), 6 of the 7 scrapers delimit an oval space of 6 to 8 sq m, situated between the debitage scatter associated with the production of LMP in the East and a concentration of burins and their spalls in the West. Although none of the scrapers could be refitted, the blanks of at least 2 items (Pl. 96: 10,15), manufactured in flint type 11/23, seem to have been produced locally (Table 87, 111 & 170). For the others, i.e. a burnt scraper (Pl. 96: 16) and 3 pieces in unspecified flint types 11/20 (Pl. 96: 14) and 11/10 (Pl. 96: 11,13), the place of production remains unknown. The 7th scraper (Pl. 96: 12), finally, isolated at 2.5m NE of the scatter, has also been manufactured from flint type 11/10.

Apart from the burnt piece, unsuitable for microscopic analysis, none of the scrapers of this locus bear traces of alteration. A single specimen (Pl. 96: 14) was used to scrape dry hide. The 5 other pieces lack any trace of utilisation.

Both of the scrapers, manufactured in a local flint type, were abandoned while they were still 'functional'. One has a weak concavity in the centre of its front (Pl. 96: 15) and the other has a scraping edge with fine, regularly spaced indentations (Pl. 96: 10). With a length of 36 mm, they both could easily have been subjected to a few more rejuvenations. Four other pieces were discarded when the further reduction of the front was no longer opportune. One of these, the only used tool of the series (Pl. 96: 14), has a pronounced overhang on its scraper-head. This would have impeded any additional resharpening. The 3 others, in fine-grained flint, display a partially crushed edge and an overhang which are due to repeated tooling attempts with a hard hammer. Finally, the burnt specimen is the only scraper from this locus that has a perfectly regular scraping edge.

The nature of the activity that had taken place at this locus can only be conjectured from the single piece used on dry hide. While there are no arguments to imply the participation of the other scrapers in this task, it is striking that they delimit an oval area, adjacent to a debitage scatter, just like at Rekem 5, area B, which was also associated with dry hide scraping. Unlike Rekem 5, however, the Rekem 11 scrapers are manufactured from different local (and extra-local?) nodules, and present a very moderate rate of utilisation, most having been discarded after a final modification attempt.

6.3.6.4 *Scrapers at habitation areas*

6.3.6.4.1 Rekem 10

The locus of Rekem 10 produced 6 scrapers (Map 128) representing only 5% of the total tools (Table 34). One is burnt (Pl. 96: 6). Three others (Pl. 96: 5,7,9), in unspecified but ubiquitous flint type 10/20, might possibly result from a local production (Tables 87, 111 and 170). One of these (Pl. 96: 5) moreover refits with a burin (Pl. 90: 1). Conversely, no parallels were found at Rekem 10 for flint types 10/25 (Pl. 96: 4) and 10/26 (Pl. 98: 8) from which the two final scrapers were made.

4 scrapers have a dry hide polish on their scraping edge (Pl. 96: 5,7,8; Table 169) and the lateral edge of one of these pieces had been used on a supple (dry) hide (Pl. 96: 4). A fifth scraper has no trace of use (Pl. 96: 9) and the burnt specimen could not be analysed appropriately.

The single scraper without use-wear traces had possibly been abandoned because of its reduced length (26 mm; Pl. 96: 9). The reason for the discard of the other scrapers is not evident. Neither the dimensions nor the characteristics associated with scraping edge and front of the used items should have impeded their further resharpening and reuse[80]. They were presumably abandoned once their task had been completed. Finally, the burnt specimen has been broken in a transversal fracture of thermal origin.

The latter piece and three scrapers used on dry hide seem to have been associated with the central hearth area (Map 130). Conversely, the other dry hide scraper and the unused specimen are situated in the southern periphery of the habitation. They may have been subjected to the centrifugal effect that seems to have guided the distribution of the cores in this habitation (section 6.2.6.3). As opposed to dry hide working at the open air locus of Rekem 5 (zone II), the distribution of dry hide scrapers inside a dwelling does not reflect any apparent organisation. The tools rather seem to occur in a secondary position, and were occasionally removed to the edges of the habitation.

6.3.6.4.2 Rekem 12

The 19 scrapers from this locus represent 27% of the retouched tools (Table 34). Most of the blanks of these tools (14/19) seem to have been produced locally (Tables 87, 111 and 170): 7 in flint type 12/24 (Pl. 96: 17,18, Pl. 97: 4,10,12,13, 16), 3 in flint type 12/11 (Pl. 97: 9, 11,17), 2 in flint type 12/12 (Pl. 97: 3,5), and 2 in flint type 12/23 (Pl. 97: 2,8). Only 2 of these scrapers refit in (short) dorsal-ventral sequences (sets 12s28 & 12s29). Conversely, 2 scrapers in flint type 12/25 (Pl. 97: 6,7) seem to have been introduced as blanks or as finished implements. For the 3 final scrapers, in unspecified flint type 12/20 (Pl. 97: 1,14,15), the production place remains unknown.

Except for 1 specimen (Table 169) that had served to scrape fresh/wet hide (Pl. 97: 6), 4 others have traces of dry hide scraping on their scraping edge cuts (N=3; Pl. 97: 4,9,12), once also on a lateral edge (Pl. 97: 8). One other scraper blank was used to saw bone/antler (Pl. 97: 1). Two pieces were too heavily altered for use-wear determination (Pl. 97: 11,15) and the 11 other scrapers lack any traces of use (Pl. 96: 17,18, Pl. 97: 2-3,5,7,10,13-14,16-17).

The scraping edge(s) of 9 scrapers are regular. Except for the broken burnt specimen and the extremely short double scraper (L=18; Pl. 97: 17), all these tools had clearly been abandoned before exhaustion. The 10 other scraper-heads are characterised by slight indentations (N= 3) or by a central concavity generated by a large and deep retouch scar (N=7). These latter tooling accidents are frequently observed on stylistically similar scraping edges, with a slightly convex or rectilinear outline and a rather steep profile. The use-wear polish on 2 of these pieces was interrupted by this resharpening attempt (Pl. 97: 4,12); 3 others had seemingly broken during this same procedure (Pl. 97: 14,16), presumably occurring locally, since one of them refits with the proximal part of its blank (refit set 12s30; Pl. 97: 2).

Since it lacks exact co-ordinates, 1 piece (Pl. 97: 7) could not be plotted on the maps (Map 128 & 130). The 18 other scrapers, however, are essentially concentrated in the circular high density artefact scatter of this locus, or dispersed outside the protohistoric ditch that divided the latter into two (section 6.2.9). This post-depositional disturbance, the rather limited use-wear results and the possible former presence of a habitation (as at Rekem 10), render this locus of limited use for more detailed spatial analysis.

6.3.6.5 *Isolated scrapers*

Some 8 scrapers were found in an erratic position in the 'circulation areas' of habitation zone 1: 3 at Rekem 8 (Pl. 96: 1-3), 4 North (N=1) and South (N=3[81]) of Rekem 4 (Pl. 94: 19), and a final piece[82] situated between Rekem 16 and Rekem 1 (Pl. 98: 5; Map 128). None of these specimens could be refitted. Although they are all of unspecified fine-grained (N=3) or coarse-grained (N=5) flint types, their manufacture was obviously not local.

3 scrapers at Rekem 8 (N=1; Pl. 96: 2) and from near Rekem 4 (N=2) served to scrape dry hide (Map 130). One of the latter was also used as a butchering knife (Pl. 94: 19). The other tools lack traces of use

[80] 2 of these, respectively 35 and 42 mm long (Pl. 96: 7,8), present a scraperhead with a neatly regularised scraping edge; a slight overhang in the centre of their front must not have hampered further resharpening. The 2 other specimens are long scrapers (48 mm and 77 mm; Pl. 96: 4,5).

[81] During the excavations – as well as in the inventory tables – these 3 pieces were actually associated with the neighbouring locus Rekem 6.

[82] During excavation and in the inventory tables, this piece was associated with Rekem 16.

(N=1) or were affected by a mechanical alteration that impeded microwear determination (N=4).

The reason for the discard of the isolated scrapers near Rekem 16 and Rekem 4 is unclear. Except for one element with fine indentations, they all have a regular scraping edge cut and could have been resharpened further. 'Loss' is not unlikely here. Conversely, the 3 scrapers at Rekem 8 had seemingly been exhausted and abandoned after the final resharpening attempts in this area. One piece suffered from breakage at 27mm from the scraper-head (Pl. 96: 3), the others present a gibbosity (Pl. 96: 1) or an overhang (Pl. 96: 2) on the scraper-head which rendered further resharpening difficult. The concentration of these elements in a limited space might reflect a short activity of sporadic hide scraping.

6.3.6.6 Rekem 1

The 10 scrapers from this locus barely represent 9% of the retouched tool assemblage (Table 34). None of them could be refitted in a dorsal-ventral sequence (Tables 87, 111, and 170). Only one specimen, in flint type 1/27 (Pl. 91: 5), can be associated with locally refitting waste material. The others are too heavily burnt (N=1; Pl. 91: 4) or are in unspecified flint types 1/10 (N=2; Pl. 91: 8,9) and 1/20 (N=6; Pl. 91: 1-3,6, 7,10) from an unknown place of reduction.

The scraper-heads of 6 tools served for dry hide work (Pl. 91: 2,6-10; Table 169). The others either lack traces of use (N=3) or were too heavily burnt for microwear determination (N=1). In fact, the scraping edge cut of the latter is heavily damaged. The scraper-heads on the other elements have either a regularised cut (N=4; Pl. 91: 1,2,6,9) or fine indentations (N=1; Pl. 91: 3) combined with a partial fracture (N=1; Pl. 91: 8). The 3 final scraping edges are quite irregular (Pl. 91: 5,7,10). Two scrapers presumably suffered from accidental breakage during resharpening (Pl. 91: 2,5). A third element (Pl. 91: 3) seems to have been intentionally broken, possibly to remove the thick distal part of the blank. This fragment could be refitted. In all, the great majority of the scrapers at Rekem 1 could hardly have been subjected to further exploitation.

The 7 scrapers that could be plotted (Map 130) are mostly located in the main compact artefact (dump?) deposit. The 2 pieces in the NE 'satellite' area may have suffered from later displacement linked with the nearby protohistoric trench.

6.3.6.7 Conclusions

At the open air work area of Rekem 5, hide fleshing or dehairing could be spatially distinguished from dry hide working. The scrapers that had been used in those activities were all of local manufacture. In case of dry hide work, resharpening and the discard of exhausted pieces were separated from the place of use. Two other possible dry hide oval work areas at Rekem 6 and Rekem 11 were always situated in a low density area, clearly separated from the main concentrations of debitage waste. In contrast, for fresh/wet hide work, there is no such apparent spatial distinction between scrapers broken during resharpening or left entire but with a non-usable front on the one hand, and those abandoned on the spot after use on the other. Possibly, the fresh or wet hide was worked vertically, attached on a frame, and exposed to the dominating (NW) winds, SE of the large fire area of Rekem 5 East (hide processing by smoking?). At Rekem 16, a similar mixture of fresh/wet hide scrapers and waste material resulting from their production and 'consumption' has been observed.

In case of dry hide scrapers, two types of mobility with regard to the distance between production and discard location may be discerned:
1. Local production of blanks and scrapers, but short distance between activity area and production/resharpening spot.
2. Extra-local production. This type of long-distance transport of dry hide scrapers may also explain their presence at circulation zones and at a dump spot.

Finally, it may be noted that this same dichotomy exists for the (few) burins used on hide. While the single burin used on fresh/wet hide was found amongst its production waste at Rekem 5, most burins used on dry hide were found isolated in the circulation zone or outside the habitation of Rekem 10 (see following section).

6.3.7 Burin consumption and Bone/antler work

The processing of hard animal matter at Rekem was primarily performed with burins and with associated tool types like borers/becs/reamers and composite tools. A detailed spatial analysis of the burins is presented below. An overview of the use-wear diagnosed on burins and burin spalls by locus is provided in Tables 172 and 173.

Morpho-metrical and functional analyses of the burins, combined with the refitting results, have revealed the particularly 'ad hoc' character of the economy of this typological group (chapter 5). The many refits with debitage waste, as well as with numerous (re)sharpening spalls, allow for an optimal reconstruction of their use-lives – a perception that could less easily be gained for the two other large categories of LMP and scrapers. Moreover, it should be remembered that any scarcity of refitted burin spalls may be partly due to specific research conditions (during recovery, recognition, and refitting of these small items; see section 5.3.2) rather than to possible extra-local burin (re-)sharpening. The factual tooling refits are presented on the maps and provide invaluable information for the spatial analysis. The differences in the mean distance between the last refitted spall and its burin, reveal a limited dis-

Table 172
Rekem habitation zone 1. Traces of utilisation on the burins at the various loci.

	Locus										
	1	4	5	6	7	10	11	12	15	16	Total
Total number	27	6	85	53	2	47	20	13	2	6	261
N suited for microwear determination	26	4	73	35	1	25	19	11	2	5	201
N with usewear traces	11	2	42	23	0	16	13	3	0	1	111
% with usewear traces	42%	50%	58%	66%	0%	64%	68%	27%	0%	20%	55%
Total N of I.U.Z.	18	5	59	30	0	22	18	4	0	3	159
Action and contact matter of I.U.Z.											
Scraping mineral matter	1	-	-	-	-	-	-	-	-	-	1
Fire-lighter	2	-	-	-	-	2	-	-	-	-	4
Cutting soft animal matter	-	-	-	1	-	-	-	-	-	-	1
Cutting fresh wet hide	-	-	1	-	-	-	-	-	-	-	1
Cutting dry hide	-	2	-	-	-	4	-	-	-	1	7
Scraping dry hide	-	2	-	-	-	3	-	-	-	1	6
Grooving dry hide	-	1	-	-	-	2	-	-	-	-	3
Scraping bone/antler	4	-	12	5	-	-	3	1	-	1	26
Sawing bone/antler	-	-	3	1	-	-	1	-	-	-	5
Graving bone/antler	9	-	39	21	-	9	13	2	-	-	93
Boring bone/antler	-	-	2	2	-	2	-	-	-	-	6
Undet. action on bone/antler	-	-	2	-	-	-	1	1	-	-	4
Butchering	2	-	-	-	-	-	-	-	-	-	2

placement of the elements between the place of modification of the tool and its abandonment. In general, burins appear to be the least mobile tool category, reflecting very local dynamics. Mostly manufactured, used (unhafted), modified, and abandoned on the same spot, they accurately locate the activity on which they were used (Map 134-136).

Within the site horizon, one can detect a neat difference in the burin/scraper ratio between the loci situated in the Northern part of habitation zone 1 (Rekem 12, 15 and 16) and those located in the South (Rekem 7, 10, 11; Map 134). The Northern part features a rate of about 1 burin for 2 scrapers (21/37) whereas, in the South, there are almost 4 burins for 1 scraper (69/18). Moreover, in the North, multiple burins are completely lacking whereas, in the South, almost a quarter of the burins has multiple burin ends (15/69). The burin/scraper ratio is about 3/2 for the concentrations in the centre of habitation zone 1, *i.e.* at Rekem 5 and 6. Finally, the presumed dump zone of Rekem 1, provided a ratio of almost 3 burins for 1 scraper (27/10), situating this assemblage between the southern and the central loci.

Table 173
Rekem habitation zone 1. Traces of utilisation on the burin spalls at the various loci.

	Locus											
	1	4	5	6	7	10	11	12	13	15	16	Total
Total number	28	1	141	65	1	44	36	28	1	1	10	356
N subjected to microwear analysis	9	0	95	46	1	28	27	22	1	0	8	237
N suited for microwear determination	9	0	79	32	1	16	25	22	1	0	8	193
N with usewear traces	0	0	9	6	0	2	2	1	0	0	1	21
% with usewear traces	0%	-	11%	19%	0%	13%	8%	5%	0%	-	13%	11%
Total N of IUZ	0	0	10	7	0	2	2	1	0	0	1	23
Action and contact matter of I.U.Z.												
Splitting hard non-woody plants	-	-	-	-	-	-	-	1	-	-	-	1
Scraping bone	-	-	-	1	-	1	-	-	-	-	-	2
Cutting fresh/wet hide	-	-	3	-	-	-	-	-	-	-	-	3
Graving bone/antler	-	-	4	4	-	1	2	-	-	-	1	12
Boring bone/antler	-	-	2	1	-	-	-	-	-	-	-	3
Undet. action on bone/antler	-	-	1	1	-	-	-	-	-	-	-	2

The burins are rarely affected by thermic alteration, *i.e.* only 2%, versus 12% of the scrapers and 18% of the LMP; 8% of the analysed burin spalls are burnt. The elevated number of burnt LMP is presumably related to the dehafting of used projectile bases near to a fire after they had been returned to the camp. As for the scrapers, the presence of burnt specimens is possibly induced by the need for a heat source for certain activities related to hide working (smoking of the hide)

The spatial analysis essentially revealed 6 distinct areas of burin distribution across the different assemblages of habitation zone 1.

6.3.7.1 Small debitage scatters (Rekem 7 and 15)

Each of these loci contained 2 burins, manufactured on the spot (3 of them refit in production sequences; Table 80) and 1 burin spall (1 refits with its burin; Table 81; Pl. 84: 2). None of these pieces has use-wear traces (Map 136). They provide rare examples of the fabrication of burins which were not immediately used on the spot and probably intended to be taken away. In fact, two more burins produced at Rekem 7 were transported away from the locus, and ultimately abandoned at Rekem 1 (section 6.3.7.5.3).

6.3.7.2 Circulation zone (Rekem 4 and periphery of Rekem 16)

This zone features some isolated burins lacking their spalls, primarily in the central area between Rekem 5/Rekem 6 and Rekem 1, and corresponding with Rekem 4 (N=6). In addition, one piece was found a few metres SE of Rekem 16 (Map 135). It is not inconceivable that these burins were lost here.

The intrusive character is evident for the isolated specimen from Rekem 16, which had been made in a fine-grained flint type that has no comparison in the lithic material from the refitted series at this locus. As for the tools of Rekem 4, although they are manufactured in a grey coarse-grained homogeneous flint that could not be further specified, none of them refits in any of the reduction sequences at this locus. In addition, there are, from a lithological point of view, no parallels between these burins and the refitted series.

At Rekem 4, 2 burins (Pl. 77: 12) lack traces of use; 2 other items (Pl. 77: 11,14), too much affected by mechanical alteration, are not suited for microscopic analysis. The final 2 specimens have 2 (Pl. 77: 13) or 3 I.U.Z. (Pl. 77: 10) caused by different actions on dry hide (scraping, cutting, and grooving). The burin from Rekem 16 combined dry hide cutting and scraping with bone/antler scraping (Pl. 88: 10). In the latter case, the activity of hide cutting with the unmodified edge adjacent to the burin facet, is clearly later than the removal of the burin spall.

Because they lack exact co-ordinates, 2 burins from Rekem 4 are not plotted on the maps. The others are widely dispersed over the area (Map 134). It is interesting to note that at Rekem only the most 'mobile' burins were associated with dry hide work. The spatio-functional analysis of the scrapers shows that the area where this activity took place is separated from the point of tooling and resharpening. Even if the observed distances are rather short, this behaviour is not attested in the cases of fresh/wet hide working or for bone/antler work.

6.3.7.3 Southern sector (Rekem 10 and 11)

The southern sector of habitation zone 1 contains 67 burins and 80 burin spalls, dispersed in three zones. These comprise the habitation at Rekem 10 (44 burins[83] and 44 burin spalls), the debitage scatter from Rekem 11, where the primary focus was on the production of LMP (10 burins and 26 burin spalls), and, finally, a small area between Rekem 10 and Rekem 11, the assemblage which almost exclusively consisted of burins (13 burins[84] and 10 burin spalls[85]; Map 137). Four burin spalls refitting with composite pieces will be integrated into the results of the spatial analysis of these tools (section 6.3.8.3), *i.e.* 1 burin spall at Rekem 10 (Pl. 104: 12) and 3 at Rekem 11 (Pl. 104: 13).

The varieties of raw material and the refitting results at the three zones in the southern sector point at the local production of blanks for most of the burins (Map 137). This is particularly true for burins in specific fine- or coarse-grained flint types (N=17, Table 50, 82 & 174). Only 3 elements of flint type 10/21 (Pl. 84: 8 & Pl. 90: 5) and a fourth in type 10/19 (Pl. 85: 9) are most likely to be extra-local. Four locally made burins refit into reduction sequences (set 10s45 in flint type 10/11, Pl. 84: 3; co-set 11c04 in flint type 11/24, Pl. 85: 21; co-set 11c07 in flint type 11/25, Pl. 86: 10; co-set 11c05 in flint type 11/22, Pl. 86: 3). The place of production of the burins manufactured in unspecified flint types 10/10, 10/20 and 11/10 remains unknown. However, for the widespread flint type 10/20, it remains a possibility that the production might be local: 4 of the 33 burins refit in short dorsal-ventral sequences (sets 10s44, 10s46, 10s50[86] and 10s51; Pl. 84: 10, Pl. 85: 7 & Pl. 90: 1,3).

Regarding the burins produced locally in specific flint types, 8 pieces in flint type 11/11, 11/21, and 11/23-25 were found in the main concentration of

[83] One of these (Pl. 84: 07) is not shown on the map because its exact co-ordinates are lacking.

[84] One of these (Pl. L86: 12) is not shown on the map because its exact co-ordinates are lacking. In the tables presenting the tools, these 13 burins are divided among the inventories of Rekem 11 (10 burins) and Rekem 10 (3 burins).

[85] In the tables, all these burin spalls are counted with Rekem 11.

[86] The burin of this series refits with a blade that was modified into a scraper (interpretation 54 in Table 82).

Table 174
Origin of burin blanks of various flint types at the loci of habitation zone 1.
* 2 pieces in the cell of flint type 1/21 are actually of flint type 7/21 as they refit with co-sets 07c06 and 07c08 of Rekem 7; 1 burin in flint type 5/11 refits with a scraper at Rekem 6 (set 05s063); 1 burin of flint type 6/20 refits with a few elements of Rekem 5 (set 05s069); the single specimen in the cell of flint type 10/22, situated in the 'intermediate burin area' between *locus* 10 and *locus* 11 (Map 142), is actually of flint type 11/22.
Legend for origin of blank (figures in cells) :
1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
3. Unrefitted, but member of a specific flint type including non-refitting debitage waste material at the locus.
5. Unrefitted and member of an unspecified flint type.
54. Member of an unspecified flint type refitted in a dorsal-ventral refit lacking debitage (i.e. only with other tools).
6. Unrefitted member of a flint type lacking debitage waste material.
7. Refitted with artefacts of other locus.
74. Refitted with tool of other locus.

	Locus									
Flint type	1	4	5	6	7	10	11	12	15	16
0	-	-	-	5	-	-	-	-	-	-
10	5	-	5	5	-	5	5	5	-	5
11	-	-	1,2,74*	2	-	1,2	2	1,2	-	-
12	-	-	-	-	-	-	-	1	-	-
19	-	-	-	-	-	6	-	-	-	-
20	5,54	5	5	1,5,54,7*	-	1,5,54	5	5	-	-
21	1,2,7*	-	1,2	2	1,2	6	2	2	1	2
22	1	-	-	2	-	2*	1,2	-	1	-
23	1	-	1,2	-	-	-	2	-	-	-
24	1,2	-	1,2	-	-	-	1	-	-	-
25	-	-	1,2	-	-	-	1,2	-	-	-
26	-	-	1	-	-	-	-	-	-	-
29	-	-	2	-	-	-	-	-	-	-
3	6	-	-	3	-	-	-	-	-	-
4	-	-	3	2	-	-	-	-	-	-

Rekem 11. A further 5 items (3 of flint type 11/22, 1 of flint type 10/11 and 1 of flint type 11/21) were found in the intermediate burin area and 4 burins in flint type 10/11 were grouped together in an area bordering the central combustion zone at Rekem 10 (Map 137). As for the burins in unspecified flint type 10/20, the local production presumed above seems to be sustained by their distribution in the Western half of the habitation where they are mixed with the debitage waste of flint 10/20. Three burins in an unspecified coarse-grained flint are situated in the intermediate burin area. The items in unspecified fine-grained flint types 10/10 and 11/10, of unknown origin, occupy the Eastern half of the concentration of Rekem 10 (N=4), a central position in the intermediate burin area (N=4), and are isolated to the W and the NE at Rekem 11 (N=2). Finally, burins of the extra-local flint types 10/19 and 10/21 were respectively situated outside the habitation, isolated in the SW part and in the NE low-density area of the habitation.

Additional refitting evidence in the Southern area provided information on burin shaping and resharpening. 13 burin spalls refit at Rekem 10, 4 in the intermediate burin area, and 4 at Rekem 11 (Map 138). Three of these elements refit onto burins that were integrated into reduction sequences, pointing at local production, shaping, and resharpening of the burins. As for the extra-local burins, refit set 10s52 from Rekem 10 is particularly interesting as it illustrates the making of a burin in extra-local flint type 10/21, imported as an unmodified (or truncated) blade (Pl. 84: 8). The other 'imported' burins could not be refitted with (re)tooling waste.

Microwear analysis shows important variations in the state of preservation of the artefacts at the various areas of the southern zone (Map 139). At the Rekem 10 habitation, nearly half of the burins (20/43) have been mechanically altered thus impeding the observation of possible traces of use. In each of the 2 other areas, only a single altered piece could be found: in the intermediate area near Rekem 10 (Pl. 84: 6) and fully isolated NE of Rekem 11 (Pl. 86: 17). Of the pieces suited for microwear determination, 4 pieces from Rekem 11 (Pl. 85: 21, Pl. 86: 6,14,16), 2 in the intermediate area (Pl. 86: 7,8), and 9 from Rekem 10 (Pl. 84: 3, Pl. 85: 4,6,7) completely lack use-wear traces.

The functional analysis of the burins reveals a remarkable contrast between the specific short-term activity areas in the East and the longer-term occupied habitation at Rekem 10 to the West. There is a strong functional homogeneity of the burins in the intermediate area and at Rekem 11 as opposed to the heterogeneous functions of the burins from Rekem 10 (Table 172). At the latter locus, 14 burins bear microscopic use-wear traces, resulting from various actions on different materials. Nevertheless, bone or antler work predominates (8 pieces): 6 for graving (Pl. 85.10,17), 1 for piercing with its bevel (Pl. 90: 6) and a last, multiple one, for graving with one burin bevel and for piercing with its opposed extremity (Pl. 90: 5). Five pieces are associated with hide working: 3 were used to cut dry hide (Pl. 84: 9, Pl. 85: 1,15), 1 served for graving it and 1 (Pl. 85: 9), finally, clearly found outside the habitation and made from an extra-local flint type[87], also served for scraping and graving this same material. One final multiple burin (Pl. 85: 16), a large specimen with two intensely rounded extremities, was used as a fire lighter. At the concentration of Rekem 11, to the contrary, the 5 burins with use-wear all served for graving bone or antler with their burin bevel (Pl. 85: 20, Pl. 86: 2,5,10). In one case, the tool was also used to scrape this material with a burin facet edge (Pl. 85: 19). Finally, in the intermediate area, 9 burins were used. Except for one item, in flint type 10/20 and found near to Rekem 10, that had been used to scrape dry hide (Pl. 84: 11), all are associated with bone or antler work: 5 for graving (Pl. 84: 12, Pl. 86: 4,9,11, 15), 1 for graving and scraping (Pl. 86: 1), and 1 for scrap-

[87] This burin might actually be associated with the isolated pieces of habitation zone 1.

ing and sawing (Pl. 86: 3). As the microscopic traces on the bevel of the last burin were truncated by the removal of a burin spall, the precise action (graving or piercing) could not be diagnosed (Pl. 86: 13).

With regard to the analysed burin spalls, only 3 elements show traces of use on bone/antler (Table 173) prior to their removal from the burin to which they refit. One spall from Rekem 11 has traces of graving (Pl. 86: 14) and 2 other spalls from Rekem 10 served either for graving with their bevel (Pl. 85: 8) or for scraping with the burin facet (Pl. 85: 17). In the latter case, the parent burin was reused to grave with its burin edge after the removal of the spall.

The spatial distribution of the burins and the burin spalls at Rekem 10 was seemingly not subjected to the centrifugal effect that governed the dispersal of most of the other objects (cf. fig. 100). An area devoid of burins and products of resharpening could be observed between the presumed wall and their maximum dispersion in the western half of the habitation. Close to the wall barring the SE entrance, one finds a concentration of burin spalls, clearly associated by their connections with the burins inside the habitation and pointing at a specialised area for the shaping and re-modification of these tools. Two of these burins could be refitted in a limited reduction sequence (10s44, 10s45) of which the debitage elements were found inside the habitation, close to the wall. From a dynamic point of view, these refits point at the manufacturing of both these tools inside the habitation and at the (re)modification sequences outside, just in front of the entrance.

There is no refitting of burins and spalls between the three areas of the southern concentrations. The contemporaneity or the simultaneity of the actions executed at these three areas has therefore not (yet) been established.

6.3.7.4 Northern Sector (Rekem 12 and 16)

6.3.7.4.1 Rekem 12

The assemblage of this locus consists of 13 burins and 28 burin spalls. The 8 burins in specified flint types 12/11 (Pl. 87: 7,9,10), 12/12 (Pl. 87: 1) and 12/21 (Pl. 87: 4,6,11,13) are made locally. The origin remains unknown for the 5 specimens made in unspecified flint types 12/20 (Pl. 87: 2,3,8,12) and 12/10 (Pl. 87: 5) (Table 50, 82 & 174). The local production of burin blanks could also be confirmed by refitting for 2 burins in flint type 12/11 (co-set 12c05; Pl. 87: 9, and set 12s31; Pl. 87: 10), and for 1 burin in flint type 12/12 (set 12s34; Pl. 87: 1). As for refitting evidence for (re-)sharpening, 4 burins refit with at least one spall (Pl. 87: 5,6,8,11). In addition, 2 burin spalls could be refitted to each other, but not to their parent burin.

On a functional level (Table 172), 2 pieces are obliterated by an alteration of mechanical origin (Pl. 87: 6,11). The burins with use-wear traces (N=3) all served on bone or antler, for engraving (Pl. 87: 3), for engraving and scraping (Pl. 87: 7) or for an unidentified action with the burin bevel (Pl. 87: 10). One burin spall in the northern area presents traces of splitting of hard non-woody plants (reeds; Pl. 90: 16). In this case, the original blade was clearly used before being transformed into a burin[88].

Due to the lack of their 3 co-ordinates, 1 burin (Pl. 87: 12) and 3 burin spalls could not be included in the spatial analysis (Map 140-142). The plotted pieces are essentially encountered in the most dense artefact area of this locus. Across this zone, the Northern half comprises a significantly higher number of burin spalls (17 spalls versus 5 burins) while the S part has an almost equal number of burin spalls and burins (5 and 6 respectively)[89]. Several metres NE of this dense artefact area, some dispersed elements were found (3 spalls and 1 burin). In fact, both these sectors are separated by a protohistoric ditch which has destroyed an unknown quantity of the lithic material from Rekem 12.

Other differences can be observed in these areas. Firstly, burins (N=7) and burin spalls (N=19) in coarse-grained flint types essentially occur in the N part of the distribution. On the other hand items in fine-grained flint types (5 burins and 6 burin spalls) are mainly situated either in the South or are isolated in the Northern extension of Rekem 12 (Map 140). The 3 burins conjoined in dorsal-ventral refits are also situated in the South, but refits of burins and spalls are exclusively made in the Northern areas of Rekem 12 (Map 141). Finally, all the traces of use were observed on the burins from the Southern part of the locus (Map 142).

6.3.7.4.2 Rekem 16

This locus contained 5 burins[90] and 10 burin spalls. The burins are essentially dispersed in the area of low artefact density, SE of the main debitage scatter at this locus (Map 134-136). Two burin spalls are somewhat isolated to the NE. The spatial distribution of the 8 other burin spalls corresponds more or less with the distribution of the burins; 6 were, moreover, tightly concentrated on a small area of less than 1 sq m, almost at the centre of the burin distribution.

Raw material exclusively consists of coarse-grained flint type 16/21. A block of this flint type was reduced in the main concentration at Rekem 16 and was almost entirely refitted (co-sets 16c03 and 16c04, and

[88] Since the use-wear traces observed on this piece are not linked with the burin dynamics, it does not appear on the maps presenting the spatial distribution of this category of items. It will be discussed in a future research program examining the function of the edges of unmodified blanks.

[89] A spatial separation between a dense zone of burin spalls on the one hand and burins on the other hand, was also observed at Rekem 10 (section 6.3.7.3).

[90] Not including the isolated piece SE of Rekem 16 mentioned in the tables of chapter 5. From a spatial point of view, this piece in flint type 16/10 has been treated with the other isolated burins of habitation zone 1 (see section 6.3.7.2).

several refitted series; cf. section 4.2.2.2). However, despite the real similarity in lithic character, there is no absolute proof – as long as they are not refitted – that the burins are indeed products of local debitage (Table 50, 82 & 174). As opposed to other concentrations, where the spot of discard after utilisation generally corresponds with the area of their production, the burins from Rekem 16 are in any case spatially separated from the debitage waste that must have accompanied the production of their blanks.

The refits illustrate fully the stages of burin modification and resharpening (Map 134). In all, 5 burin spalls could be refitted to 3 burins (Pl. 88: 5). From a stylistic point of view, the massive appearance of these 3 tools may be stressed. In one case (Pl. 88: 10), the burin was intentionally broken at some 4 cm from its burin bevel. The proximal part of the blank was re-modified into a burin and its primary spall refits with the distal ends of 2 burin spalls from the initial tool. In another case, 3 retouch flakes could equally be refitted onto the completely retouched left edge of the parent burin (Pl. 88: 6). It is worth noting that for each of these refit series, at least one piece of tool waste was found in the small central area measuring 1 sq m.

Together, these items seem to locate a well-defined activity area. However, although only one of the burins was too much altered for micro-wear analysis (Pl. 88: 8), none of them preserved traces of use (Map 136). The only indication of use, caused by the graving of hard animal matter, was found on the bevel of a burin spall. This spall could not be built into a refit sequence, but its raw material is similar to that of the 3 burins with refitted tool waste.

6.3.7.5 Central sector (Rekem 5, 6, and 1)

6.3.7.5.1 Rekem 5

The concentration at Rekem 5 includes 85 burins and 141 burin spalls. Most were manufactured in several varieties of fine-grained (15 burins and 16 burin spalls) and coarse-grained flint (68 burins and 113 burin spalls; Tables 50, 67, and 68). Two burins were produced in flint type 4; 3 burin spalls are in flint type 3, and 9 burnt spalls, finally, were manufactured in an undetermined flint type. The place of production for 24 burins in flint type 5/10 (N=4) and 5/20 (N=20) cannot be identified (Table 174). Except for a few elements (see below), all the other burins seem to have been produced locally. Two-thirds (38/57) can actually be refitted into reduction sequences: 13 in fine-grained flint 5/24 (05c03), 8 in flint type 5/25 (05c12, 05s064 and 05s068), 7 in flint type 5/23 (05c05 and 05s067), 4 in flint type 5/11 (05c19, 05s063, 05s076 and 05s078), 3 in flint type 5/21 (05c01, 05c08 and 05c14) and 3 in flint type 5/26 (05c22 and 05s062). Several nodules were clearly knapped for the almost exclusive production of burins (flint types 5/24, 5/23, 5/25 and 5/26; see section 4.2.2.2). On the other hand, a few burins refit in co-sets that were originally destined for the production of a different tool type (*e.g.* 14 scrapers in case of flint type 5/11, 17 scrapers for flint type 5/21; section 6.3.6.1).

In all, the refits include 53 burins and 61 burin spalls, *i.e.* 62% and 43% of these respective categories (Tables 80 and 81). The latter are often integrated in the reduction sequences mentioned above. Only in 13 cases are burins exclusively conjoined with one or several burin spalls, yet 11 of these, in flint types 5/11, 5/21, 5/24, and 5/25, apparently also result from local production. For the 2 final pieces, in flint type 5/10, the local origin of their blank production remains unestablished. Finally, 5 refitted series of burin spalls without burin were established at Rekem 5 (Pl. 90: 9-12). In addition, 2 burins that could not be refitted into reduction sequences could be conjoined with a fragment from their blank in a fracture, accidental in one case (Pl. 80: 15), intentional in the other (Pl. 78: 2).

All burins and spalls have been recorded in 3 dimensions, allowing for an exhaustive spatial analysis of this tool type category. The majority, *i.e.* 83 burins and 138 burin spalls come from the eastern sector, roughly overlapping with the most artefact-rich area at Rekem 5 East. All the tooling refits are also situated in this sector (Map 144), where the burins are thus mixed with debitage and tooling waste related to the production, modification and resharpening of burin blanks.

This overall concentration can be structured by the distribution of the main flint varieties (Map 143). In the central part of the concentration, debitage waste from burin blank production sequences in specified coarse-grained flint types, is essentially distributed in two distinct areas. The first, in the West (area A), corresponds with flint type 5/24. The other, in the East (area B), consists of two almost overlapping distribution zones containing flint types 5/23 and 5/25. Moreover, the few refitted blanks of co-set 05c22 (flint type 5/26) were also found across area B. The discarded burins, as well as their burin spalls, tend to concentrate on the sector where the two areas partially overlap. Some burins were abandoned to the North and South of this concentration. In addition, the Southern edge of the burin concentration (area C) essentially comprises artefacts of flint type 5/21, at an area with numerous scrapers, mostly used for fresh/wet hide working (zone I; section 6.3.6.1.1).

As for the fine-grained varieties, the few burins manufactured in flint type 5/11, whether refitted or not, are situated in the zone of dispersal of debitage waste produced in this same flint type at Rekem 5 (Map 131). This scatter essentially contains waste material issued during the fabrication and re-modification of scrapers used for dry hide work (Map 132; section 6.3.6.1.2). Burin areas A and B are overlapping here (Map 143). The uniformity of burin production across these 2 areas and the very high refitting rate suggest that the artefacts manufactured in these materials were not subjected to later recycling.

However, it remains a possibility that the opposite situation may have occurred with the fine-grained flint type 5/11. Some of the blanks from this reduction sequence, abandoned on the floor after the dry hide scraping activities, could have been selected and modified into a burin during bone or antler work. The burins and their occasionally refitting burin spalls in flint type 5/10 are, like the scrapers in this same material, more widely dispersed, peripheral to the scatter of elements in flint type 5/11.

The few burins in poorly represented flint types 5/29 and 4, are distributed in the main concentration at Rekem 5 East. None of them could be refitted. Although some other tools and debitage in these flint types were present (Table 174), it is possible that the burins were not produced locally. In fact, the few blanks, LMP, and burins in flint type 4 may well have been introduced as finished products. The association of the burins of flint type 5/29 with the almost completely refitted co-set 05c04 may represent a fortuitous result of flint type classification rather than a real occurrence. The flint type of this co-set seems to be exactly identical to the burins but it was knapped more than 5 meters away from the latter (Map 45). The spatial distribution of the burins in the unspecified coarse-grained flint type 5/20, of which the place of production and (re)sharpening could not be established, is extremely wide. They were found at Rekem 5 West, as well as along the eastern edge and outside the concentration of Rekem 5 East. Finally, the absence of the burins corresponding with the 3 burin spalls in flint type 3, found at Rekem 5 East, suggests that some tools were exported.

At Rekem 5, many burins have use-wear (58%, or 42/73, not including the 12 burins that were too much altered by mechanical actions (N=11), or by chemical influence (N=1); Tables 172 and 173, Map 145). Except for 1 burin and its refitted burin spall, used to cut fresh/wet hide (Pl. 78: 10), all other pieces (Pl. 78-82) were used on bone or antler. They have been used for engraving (43 IUZ on 37 burins and 4 burin spalls) and, less frequently, for scraping (12 IUZ on 10 burins), sawing (3 burins), piercing (2 burins and 2 burin spalls[91]) and an unspecified action (2 burins and 1 burin spall). A certain number of burins combine traces of one or several of these actions (*e.g.* Pl. 79: 7,11-13, Pl. 80: 3,8,19, Pl. 81: 14).

On the whole, the burins at Rekem 5 were generally used, resharpened and discarded on their spot of production. The manufacture of these tools could occur in four different ways:

a) embedded in a serial fabrication of this tool type, starting from a primary nodule;
b) same, but started from a recycled core;
c) by modifying recycled blanks that had originally been knapped for other tool types;
d) as an occasional production, realised while making a series of tools of a different type.

a) Serial production

Serial production of burins at Rekem 5 is particularly well illustrated for 4 refitted co-sets.

- Co-set 05c03 in flint type 5/24 generated, in addition to a range of unmodified blanks, 13 burins and 16 burin spalls, a truncation, a retouched piece, and 1 robust LMP. Half of the burins (N =6), as well as 2 refitted burin spalls and 1 unmodified blank bear traces of use on bone or antler. One burin only served for boring (Pl. 82: 2) and 4 others for graving with the burin bevel (Pl. 79: 19, Pl. 80: 1,7). One of the latter, a double burin, also served with its opposite burin edge in an undetermined action (Pl. 82: 6). The last burin, finally, was used in an unknown action (Pl. 81: 18). Graving, as well as an unidentified action on bone or antler could be observed on 2 burin spalls (Pl. 80: 7). The unmodified blank, finally, served to saw these materials.
- Co-set 05c05, in flint type 5/23, gave rise to several unmodified blanks refitted with their core, as well as to 6 burins and 5 burin spalls (and 1 retouch flake), in addition to 1 scraper, 1 composite tool and 1 randomly retouched piece. Four burins, the scraper and the composite tool, as well as 2 burin spalls, bear microtraces of contact with bone or antler. One burin served to grave with a burin edge (Pl. 81: 13), 1 other to saw (Pl. 78: 11) and the 2 remaining ones have several use zones (I.U.Z.) resulting from diverse actions including scraping, sawing, and graving (Pl. 80: 3, Pl. 81: 14). The 2 refitted burin spalls were generated during the modification of a bec; they bear traces of rotation (Pl. 79: 2). Scraping of bone occurred with the scraper (Pl. 94: 16) and with the scraping edge of a composite tool, of which the opposed burin edge served to grave (Pl. 105: 1). Furthermore, a small refitted series (05s067), also of flint type 5/23, includes 1 burin that served to scrape and to grave hard animal matter (Pl. 80: 8);
- Co-set 05c12, in flint type 5/25, includes some unmodified blanks, as well as 3 burins and 1 truncated tool. One burin spall also refits with one of the burins. Not a single microtrace of utilisation could be perceived. In addition, several small refitted series, not conjoined with co-set 05c12, could be associated with it, based either on their type of raw material or their style. Some of these series combine burins with some unmodified elements. 05s064 includes 1 burin and 4 fragments showing 3 burin bevels, and 2 other burins refitting with the small reduction sequence 05s068; only the burin of series 05s064 was successively used for the scraping (2 IUZ) and graving (2 IUZ) of hard animal matter (Pl. 79: 11-13).
- Co-set 05c22, in flint type 5/26, comprises 2 burins and 2 burin spalls, all devoid of use-wear traces. The burin of refitted series 05s062, which also might be part of this reduction sequence, had been used to grave bone or antler with its burin bevel (Pl. 80: 5).

b) and c) Recycling

There are a few indications that flint artefacts already lying on the surface have been occasionally recycled during a session of bone or antler working. This seems to have been particularly the case for flint type

[91] This applies to 2 secondary burin spalls of a former bec, refitted onto the burin of Pl. 79: 2.

5/11, of which debitage waste is distributed over a well-defined area. This flint type was primarily employed to make a series of scrapers used for dry hide work at zone II (section 6.3.6.1.2), but a few blanks were also modified into burins; 4 of these refit in more or less important reduction sequences (05c19, 05s026, 05s063, 05s078). All 4 have been used, 3 to grave bone or antler (Pl. 79: 6,20, Pl. 80: 17) and the last one, refitted with 2 burin spalls, to scrape and grave this material (Pl. 79: 4). The place of abandonment overlaps with the limited dispersal area of artefacts in flint type 5/11. At the same time, it covers areas A and B of the burins manufactured in coarse-grained flint types 5/23-26. It is not inconceivable that while working bone or antler with burins of the latter series, the artisan(s) occasionally recycled parts of flint type 5/11. Until sufficiently extended refits can be established, there is no formal proof whether it concerns a recycling of cores formerly exploited for a production of other tool types, or rather a collection of unmodified blanks from earlier knapping sequences. The only refit series (05s063) that combines a scraper and a burin, clearly shows that the scraper blank was manufactured prior to that of the burin. It is possible, however, that this scraper, used on dry hide and abandoned at Rekem 6, was also made from a blank recycled at Rekem 5.

d) Occasional or secondary production

This scenario can be invoked for an unmodified blade that had been used to cut fresh/wet hide before being transformed into a burin for an identical purpose (Pl. 78: 10). This piece belongs with co-set 05c14 (flint type 5/21) which mainly yielded a series of scrapers used for hide fleshing or dehairing at zone I. The burin thus figures in a 'tool kit' designed for working fresh/wet hide.

Two other reduction sequences (05c01 and 05c08), in the same flint type 5/21, of which the knapping products are also located in zone I, but that are not (yet?) refitted with co-set 05c14, both include one burin. Members of these refitted co-sets were also used on hide. Two scrapers from co-set 05c08 have been used on fresh/wet hide (Pl. 78: 11) and one unmodified flake of co-set 05c01 had served to cut hide; the latter co-set also includes an unused scraper (Pl. 77: 12). The burin of co-set 05c08, to which one burin spall could be refitted, was employed in a fully different activity, namely bone or antler work (Pl. 78: 18). It seems to have been manufactured on a recycled blank[92]. We do not know whether the burin from co-set 05c01, completely devoid of use-wear traces, also results from a similar recycling procedure, or whether it was designed to be used in the initial stages of fresh/wet hide work.

In addition to the burins refitted into reduction sequences, other tools could be refitted with a fragment of their blank, and/or with one or several burin spalls that, given their lithological characteristics, can be associated with co-sets or series described above.

- 9 burins in flint type 5/23-26, including 4 pieces that served to grave hard animal matter (bone/antler; Pl. 79: 9, Pl. 80: 6, Pl. 81: 10, Pl. 82: 4) originate from a type a) serial fabrication of burins destined for bone or antler work.
- 7 burins in flint type 5/11, 5 of which served to grave hard animal matter (Pl. 78: 13, Pl. 79: 8, Pl. 80: 18, Pl. 81: 15, Pl. 82: 3), were made on former blanks collected on the spot (scenario b) or generated by the debitage of recycled cores (scenario c). The presence of 3 fully cortical pieces (Pl. 79: 8, Pl. 80: 18, Pl. 81: 15) in this series does not seem to favour the latter scenario.
- 3 burins in flint type 5/21, of which one, as well as 2 of its refitted burin spalls, carry traces of graving bone or antler (Pl. 78: 2), also seems to be a recycled item.

The functional analysis of flint types 5/10 and 5/20, which generated respectively 4 and 20 burins with an unknown place of manufacture, revealed that 7 pieces have been used to grave bone or antler (Pl. 78: 14, Pl. 80: 4,9,10,12, Pl. 81: 8, Pl. 82: 1) while 3 others served to scrape and grave this same substance (Pl. 79: 7, Pl. 80.19, Pl. 82: 7).

Finally, for the possible imported burins in flint types 5/29 and 4, only the 2 tools in flint type 4 had been used to grave (Pl. 78: 12) or to pierce (Pl. 80: 13) hard animal matter.

In conclusion, the burins from Rekem 5 reveal:
1) an *ad hoc* economy with a local serial production of these tools, occasionally including the fabrication of a different tool type that was used in the same task;
2) recycling of blanks found on the spot;
3) possible import of just a few pieces.

It should be stressed, finally, that the 'occasional production' scenario, (i.e. an artisan using tool classes of distinct morphologies in a single activity) rarely occurred at Rekem[93].

6.3.7.5.2 Rekem 6

53 burins and 65 burin spalls were discovered across this locus. One burin and 2 burin spalls were completely altered by fire. The others had been manufactured in a fine-grained flint type (12 burins – 11 in flint type 6/10 and 1 in flint type 6/11 – and 17 burin spalls) or a coarse-grained variant (37 burins – 33 in flint type 6/20, 2 in flint type 6/21, and 2 in flint type 6/22 – and 45 burin spalls; Tables 50 and 67). The series is completed by 1 burin in flint type 3, and 2 other burins and 1 burin spall in flint type 4.

For most burins in unspecified flint types 6/10 and 6/20 (40 unrefitted items and 2 burins refitting onto each other in set 06s54), local blank production remains hypothetical (Table 174). Only 2 burins, made in unspecified coarse-grained flint type 6/20, could be integrated in local reduction refits (06c05

[92] This blank is situated between 2 scrapers in the reduction sequence, showing that it was definitely produced during the serial fabrication of scrapers at area C of Rekem 5, destined for fresh/wet hide work. This seems therefore indeed an example of blank recycling (scenario c), rather than re-exploitation of a core (scenario b).

[93] Co-set 05c05, for instance, delivered one scraper used on bone, next to a series of 6 burins.

and 06s53) which contain only a few elements (max. 6). Another small sequence (5s69) consists of 3 blades, of which one was modified into a burin (Pl. 82: 10), and illustrates the inter-site connection between both Rekem 6 and Rekem 5. One of the blades, as well as the burin, was found at Rekem 6, whereas the other blade and the burin spall originate from Rekem 5. The great similarity between flint types 6/11 from Rekem 6 and 5/11 from Rekem 5 could be another indication of the close relations between these neighbouring loci. However, the presence at Rekem 6 of occasionally refitting debitage products in this flint type suggests that the knapping of flint type 6/11 occurred at least partially at this locus. The same is true for the 6 burins in flint types 4, 6/21, and 6/22. Finally, the single burin in flint type 3 at Rekem 6 is accompanied by unrefitting debitage waste only.

Evidence for (re)sharpening has been established by refitting 8 burins with spall(s) or with a retouch flake (Pl. 82: 15,16, Pl. 83: 6). Two of them are also included in dorsal-ventral refits. In addition, 2 pairs of burin spalls could be conjoined (Pl. 90: 14-15).

One third of the burins (18/53) and 14 burin spalls were not suitable for microwear determination because of heavy mechanical (17 burins and 8 burin spalls) or thermic alteration (1 burin and 6 burin spalls). 23 burins and 6 spalls have traces of use. Except for 1 burin that served to cut soft animal matter with an unmodified lateral edge[94] (Pl. 83: 16), all had been used on bone or antler (Tables 172 and 173). Graving represents the principal action (*e.g.* Pl. 82: 16, Pl. 83: 7,11,12), occasionally combined with boring (Pl. 89: 9,11), scraping, or a combination of scraping and sawing (Pl. 82: 10). One burin spall has a polish that was partially destroyed by micro-removals which do not permit the identification of the action that provoked it.

44 burins and 59 burin spalls are plotted on the maps used in the spatial analysis. The majority of these pieces, mostly in coarse-grained flint (Map 146), occupy a large central area, more or less corresponding with the main distribution area of all flint material. This zone contains the highest number of refits (Map 147) and repeatedly links elements from Rekem 6 with pieces from Rekem 5 (Map 64). The density of burins, and especially of burin spalls, clearly decreases to the S and the SW, where most items are of fine-grained flint types. Four burins, finally, are isolated to the N and NW (2 refitting burins in set 06s54) of the concentration.

The mechanically altered specimens mainly occupy a position on the edge of the main concentration of burins and burin spalls at Rekem 6, in the E (8 burins and 3 burin spalls) and SW (5 burins and 2 burin spalls; Map 148). The burnt burin spalls are situated in the centre of the principal scatter. Four of them belong to a single square metre and the only burnt burin is isolated N of Rekem 6. The mapping of the use-wear results did not show a consistent patterning (Map 148). This apparent lack of spatial organisation in the activities executed with the burins at Rekem 6 again questions the very nature of this concentration. The numerous refits between Rekem 6 and Rekem 5 could suggest that this area had (partially) functioned as a dump zone, built up from the artefacts used in the activities undertaken at Rekem 5 and finally discarded here. A number of other interpretations may, however, be presently considered:

1) the production of artefacts at Rekem 5 and discard of waste at Rekem 6.
2) the production of artefacts at Rekem 5 and their recycling for use at Rekem 6.
3) the opposite of 1.
4) the opposite of 2.
5) the extra-local production and abandonment of artefacts in both of the concentrations.
6) various combinations of 1-5 above.

6.3.7.5.3 Rekem 1

The assemblage at this locus includes 27 burins and 28 burin spalls. All pieces have been manufactured in coarse-grained variants, except for 3 burins and 2 burin spalls in fine-grained flint type 1/10, and for another burin in flint type 3 (Tables 50 and 67).

For most elements, the origin of the blank production remains undetermined (Tables 82 and 174). The blanks of 2 burins in flint type 7/21, refitting into co-sets 07c06 (Pl. 72: 18) and 07c08 (Pl. 2: 3, Pl. 75: 8), were manufactured at the small knapping area at Rekem 7 over 20m away. The only other items of this flint type found at Rekem 1 are a few unmodified blanks and 1 LMP. The single burin in flint type 3, the debitage waste of which is lacking at Rekem 1, seems also to have been imported. Conversely, 5 burins refit into more or less elaborate local reduction sequences at Rekem 1. Two, made of flint type 1/21 (Pl. 76: 6, Pl. 89: 1) refit into co-sets 01c01 and 01c02 and another, in flint type 1/22 (Pl. 76: 1), refits into co-set 01c11. A fourth example, in flint type 1/24 (Pl. 76: 5), refits into co-set 01c03 and the last one, in flint type 1/23 (Pl. 76: 3), is included in the small set 01s01. Two other burins, in flint types 1/21 and 1/24, though not refitted, can be associated with the former by virtue of their specific flint type. All these items were presumably produced locally, either in a serial production of burins or from recycled unmodified blanks found on the spot. On the other hand, it is possible that the production of these tools occurred in another sector of the site, in which case Rekem 1 would represent a dump area that had received the remnants of various activities.

Local tooling has been found on 4 burins refitting with their spalls (Pl. 77: 1). In one particular case, a burin spall could be refitted onto the dorsal surface of another burin (Pl. 76: 8).

Microscopic examination of the burins subjected to the spatial analysis p:ovided the following results. Except for 1 tool with an alteration of mechanical

[94] This burin was found next to a truncated tool that carries identical use-wear (see further section 6.3.8.1.2.c; Map 153).

origin (Pl. 76: 9), all other burins (N=26) could be functionally diagnosed. Eleven had been used. Five had served to grave bone or antler with their burin bevel (Pl. 76: 2,4,8,19, Pl. 77: 1). Three others, including 1 burin of which the blank was manufactured at Rekem 7, performed the same task but have additional traces of scraping this same material (Pl. 76: 14,15, Pl. 77: 3). Two burins served to butcher a carcass with an unmodified edge (Pl. 76: 13). In one case, *i.e.* the second burin from Rekem 7, the small burin scar situated at the distal extremity of the blank may have been generated accidentally during such an activity (Pl. 72: 18). A final piece presumably served as a fire lighter (Pl. 77: 2). The 2 latter activities are quite rare amongst the burins generally.

Only 18 tools and 24 burin spalls could be recorded three-dimensionally. The maps show that the majority, *i.e.* 11 burins and 18 burin spalls, are situated in the zone of high artefact density at Rekem 1. The others are isolated in the North (3 burins and 3 burin spalls) or in the South (4 burins and 3 burin spalls). The latter location includes the 2 tools imported from Rekem 7 (Map 149) but a burin spall of one of these was recovered from the principal high-density concentration (Map 150). The Southern area is also marked by burins that had served to grave and scrape bone or antler, whereas the used burins in the Northern sectors had exclusively been used as 'gravers' (Map 151).

6.3.7.6 Other evidence of bone/antler work

Tables 175 and 178 show that borers, becs, reamers, and composite tools were also often employed for bone or antler working. The detailed spatial distribution of these tool categories, presented in sections 6.3.8.2 and 6.3.8.3, seems to have been closely associated with the patterning observed for the burins.

Finally, it may be noted that quartzes used as cooking stones (especially at Rekem 5 and Rekem 10) are always associated with bone and antler working, as well as with some heavy-duty tools. Although this may purely result from a common focus on the hearth, it is also possible that these objects played a role in the ultimate processing of the bone remnants, *e.g.* in the extraction of marrow.

6.3.8 Spatial analysis of other tool types

Whereas LMP, scrapers, and burins are respectively associated with hunting, hide scraping, and bone or antler work, the other tool categories at Rekem had been used in a broader range of activities. The spatial analyses of the truncated tools, borers, becs, reamers, and composite tools (Map 152) are presented in the following sections. Because of their limited number and erratic character, randomly retouched pieces have not been considered.

[95] Five pieces at Rekem 1, 1 at Rekem 6, and 1 at Rekem 12 are not shown on the map because their exact co-ordinates were not registered.

6.3.8.1 Truncated blades and flakes

Although the production place of most truncated tools could not be exactly established, it appears that these pieces were rarely brought into the site as finished implements (Tables 116, 124, and 167; see section 5.5.3).

Of a total of 73 truncated tools from habitation zone 1, 11 pieces were too heavily altered for an adequate microscopic analysis, 54 are lacking traces of utilisation, and 8, finally, bear microscopic (N=7) or macroscopic traces (1 projectile point) of use (Table 168).

6.3.8.1.1 Unused and/or heavily altered pieces

For the large majority of these specimens (51/65), it is still unclear whether they represent truly intentional tools, fabrication waste products (preliminary shapes, waste of intentional fracturing etc.) or the accidental products of undetermined origin (such as 'spontaneous' retouch provoked during debitage, by trampling, or by sediment pressure). This concerns pieces with fractures adjacent to the truncation (N=28) or else with a partial (N=4) or complete truncation (N=19) whether broken (N=11) or complete (N=12). With regard to their intra-locus spatial distribution[95] (Map 153), these objects are associated with the most densely populated artefact areas at Rekem 1 (N=15, inside the scatter, except for a single piece found NE, in a low density zone; Pl. 100: 1-4,6), at Rekem 5 East (N=3, in the central sector of the scatter), at Rekem 6 (N=7; dispersed all over the concentration; Pl. 100: 18, Pl. 101: 3), Rekem 10 (N=6, in the Western sector of the interior space; Pl. 101: 9), Rekem 11 (N=3, on the edge of the scatter) and Rekem 12 (N=1, in the main artefact area). Conversely, at Rekem 7, they were slightly off-set to the West of the concentration (N=2). At Rekem 16, they were found in the low-density artefact zone, SE of the concentration (N =4; Pl. 101: 15). Two other pieces were recovered from the intermediate area between Rekem 5 West and Rekem 5 East. Finally, one element (Pl. 100: 8) is derived from Rekem 4, a locus characterised by a low artefact density.

Next to these pieces, a smaller group of truncated tools (N=14) could be morphologically associated with other tool types (section 5.5.2).

a) Production waste of LMP (N=5)
Four of these pieces were found at Rekem 7 (Pl. 101: 5-8) and 1 at Rekem 5 (Pl. 100: 14). Two more elements, already included in the list above, might possibly be added to this group (Pl. 100: 6). They were refitted into set 01s50 from Rekem 1. Their morphology does not recall the form of a LMP (or LMP waste product) but they are refitted to a fragment of a large LMP (Pl. 68: 5).

At the small LMP production area at Rekem 7, the tools were found on the Western edge of the

concentration. They have simple, very oblique truncations, either straight (N=2; Pl. 101: 8), one transversally broken during tooling (Pl. 101: 5), or curved (N=2; Pl. 101: 6,7). At Rekem 5 East, the unique specimen, a simple, very oblique truncation on a bladelet (Pl. 100: 14), was situated in the central sector of the scatter and may have been associated in this locus with some scarce witnesses of projectile fabrication and rejuvenation (section 6.3.4.2).

b) Scrapers (N=4)

Three of these specimens were found at Rekem 6 and 1 at Rekem 7. The truncated elements of Rekem 6, interpreted as scrapers, are either poorly shaped (Pl. 100: 17), or abandoned in the course of (re)-sharpening (Pl. 100: 15,20). Two of these, in flint type 3, were clearly 'imported' to Rekem 6 and are reminiscent of the 2 scrapers in this same material. One of the latter had been used to scrape bone/antler (Pl. 98: 15; see section 6.3.6.2.1). Only one truncated tool appears on the map (Map 153). It is located in the Western part of area B of the scraper distribution in this concentration (Map 130).

The specimen from Rekem 7, while refitting with a LMP (set 07s36; Pl. 75: 9), presents all the characteristics of a scraper-head and may point at occasional recycling. Made in flint type 7/21, it can be associated with the scrapers from this area which have been made in the same raw material (section 6.3.6.3.1).

c) Burins (N=4)

Four truncated tools, unused (N=3) or altered (N= 1), could be related to burins. One of these (Pl. 100: 12), manufactured in flint type 5/24 at Rekem 5 East, presents some small inverse hinging scars, possibly corresponding with attempts at burin spall removal. It was found in the same well-defined zone as the other artefacts of co-set 05c03, to which it could be refitted and which had produced 13 burins, of which 6 were used on bone/antler. Evidently this piece has to be connected with the utilisation of the burins in this co-set.

The 3 other specimens belong in 3 different loci. They are manufactured in non-specific flint types and could not be refitted. One (Pl. 100: 7), similar to a Lacan burin, comes from the NW sector of Rekem 4, another (Pl. 100: 16) from the N sector of Rekem 6, and a third (Pl. 101: 16) from the SE low-density artefact zone at Rekem 16 (Map 153). These locations also host numerous burins (Map 134).

d) Borer

A final truncated tool, found at Rekem 10, is a small fragment with a simple oblique and pronouncedly concave truncation. Its shape suggests a short splintered drill that seems to have served in a rotating action (Pl. 101: 10). It was found in the S sector of the combustion area, that also produced most of the borers/becs/reamers of the locus (Map 153).

6.3.8.1.2 Utilised pieces (N=8)

a) Hunting (N=2)

Two truncated tools have diagnostic impact traces: a base of a projectile, found in the main scatter of Rekem 1 (Pl. 100: 5) and a 'shouldered point' from the E zone of Rekem 6 (Pl. 101: 4). These objects have to be correlated with the fragments from projectile armatures that have been found in both these concentrations (sections 6.3.4.2-3).

b) Butchering (N=2)

Two truncated tools, from Rekem 5 (Pl. 100: 9) and Rekem 6 (Pl. 101: 1), served as butchering knives. The former, manufactured in flint type 5/212, was found near the hearth at Rekem 5 West. It refits in a sequence with a crested blade (set 05s059; Pl. 100: 10), which was also used to cut up carcass, and is lithologically associated with another laminar sequence at this location (05c17, Pl. 42). It also has traces of the cutting of soft animal matter. This points at a local manufacture and use. However, a series of 11 refitted blades and laminar flakes in this same flint type (co-set 05c09, Pl. 39) are widely distributed at Rekem 5 East and at Rekem 6 (Map 49) which suggests rather high mobility. Almost half of the pieces in this co-set (N=5) also have traces resulting from carcass cutting traces or the cutting of soft animal matter.

The truncated element at Rekem 6, in unspecified flint type 6/20, was found in the 'heart' of the concentration.

c) Cutting soft animal matter (N=1)

This single specimen, found at Rekem 6, served to cut up an undetermined soft animal matter (hide, meat, tendons etc.; Pl. 100: 19). The curved outline of the very oblique truncation connects this piece typologically with the large LMP group. It is situated 3m W of the truncated tool which had been used as butchering knife, but very close to a burin, made in a similar fine-grained flint type, that carries identical use-wear and that presents a rather comparable general layout (Pl. 83: 16; Map 148; see also section 6.3.7.5.2).

d) Hide work (N=1)

A single piece, found at Rekem 6, but not mapped in detail, served to cut dry hide (Pl. 101: 2). It was manufactured in an unspecific fine grained flint type (6/10).

e) Bone/antler work (N=1)

One truncated element from Rekem 5 East (Pl. 100: 11), broken after utilisation, but connected with its fragment in set 05s094, served to saw bone or antler. It was located on the E edge of the concentration and manufactured in local flint type 5/21. By its raw material, this piece can be linked with the numerous co-sets (05c01, 05c08, 05c10 & 05c14) that furnished most of the scrapers used in fresh or wet hide working at zone I at Rekem 5 East (section

Table 175
Rekem habitation zone 1. Traces of utilisation on becs, borers, and reamers at the various loci.

	Locus							
	1	5	6	10	11	12	16	Total
Total number	2	15	8	10	1	2	2	40
N suited for microwear determination	2	13	6	7	1	2	2	33
N with use wear traces	0	5	4	4	1	1	1	16
% with use wear traces	0%	38%	67%	57%	100%	50%	50%	48%
Action and contact matter								
Fire-lighter (?)	-	-	1	2	-	-	-	3
Graving dry hide	-	-	-	-	-	-	1	1
Piercing dry hide	-	1	-	-	-	-	-	1
Graving bone/antler	-	1	-	1	-	-	-	2
Boring bone/antler	-	3	3	-	1	1	-	8
Piercing unspecified boring matter	-	-	-	1	-	-	-	1

6.3.6.1.1; Map 132). The morphology of the retouched extremity of this tool can be read as a misconceived scraper-head. The tool seems to be recycled afterwards for bone or antler working.

f) Working an undetermined hard matter (N=1)
1 very obliquely truncated tool from Rekem 5 (Pl. 100: 13) served to pierce an undetermined hard material. Though not refited, it can be connected with co-set 05c12 (flint type 5/25; Pl. 39) which also contains another truncated tool, 3 ill-shaped burins (Pl. 78: 5,7,9) and a range of laminar blanks, all lacking traces of use. This piece was found in the distribution area of the elements in co-set 05c12, in the central sector of Rekem 5 East (Map 51).

6.3.8.2 *Borers, becs, and reamers*

Half of these tools (17/33 – not including 7 altered pieces unsuited for a microscopic analysis) are lacking micro-traces of use (Table 175). Yet, 7 of these specimens, as well as 1 altered piece, present macroscopic marks caused by rotating on hard matter. Table 175 shows that borers/becs/reamers are often employed for bone or antler work. The detailed spatial distribution of this tool category seems closely associated with the patterning observed for the burins. They are found in particularly high numbers at the Western loci (Rekem 5, Rekem 6 & Rekem 10) but rarely along the Eastern axis (Map 154).

80% are manufactured in a non-specific flint type (Table 126), hampering the determination of the production place of most of these tools (Table 176). Only 3 pieces refit into a reduction sequence (Table 133). One (Pl. 102: 1), from Rekem 5, in flint type 5/21 (co-set 05c14), another (Pl. 102: 30), from Rekem 10, in flint type 10/10 (set 10s49) and a final piece (Pl. 103: 6), from Rekem 16, in flint type 16/25 (co-set 16c05). One piece, finally (Pl. 102: 29), in flint type 10/12, was clearly 'imported' into Rekem 10.

[96] Two pieces, at Rekem 1 and Rekem 6 are not shown on the map because their exact co-ordinates were not registered.

6.3.8.2.1 *Pieces without traces of use*

Unused (N=10) or altered pieces (N=6), also lacking characteristic traces, have been retrieved from Rekem 1 (N=1), Rekem 5 (N=5; Pl. 102: 2,3,6,8,13), Rekem 6 (N=4; Pl. 102: 16-18,21), Rekem 10 (N=4; Pl. 102: 23,27,29,30), Rekem 12 (N=1; Pl. 103: 3) and Rekem 16 (N=1; Pl. 103: 6). Only the latter specimen refits in a reduction sequence (16c05; Pl. 67) and 1 bec from Rekem 10 (Pl. 102: 30) was manufactured on a plunged burin spall refitted to its burin (set 10s49).

These borers, becs and reamers are generally found in the main concentrations of their locus[96] (Map 154). Two pieces, however, are situated outside the habitation of Rekem 10. One of these, the imported specimen of Pl. 102: 29, can be joined with the intermediate burin area between Rekem 10 and Rekem 11 (Map 139).

6.3.8.2.2 *Used pieces*

a) Working hard matter
The observed uses are largely dominated by rotating actions (N=17) on a hard matter, microscopically identified as bone or antler in 8 cases. One piece has a microtrace that did not allow for an identification of the exact nature of the worked hard material. The 8 other pieces (including 1 altered tool) are totally devoid of micro-traces of use. They present a

Table 176
Origin of blanks of borers, becs, or reamers by flint type at the various loci of habitation zone 1.
* 1 reamer in flint type 5/10 at Rekem 5 and 1 bec in flint type 10/20 at Rekem 10, are manufactured on a burin spall that refits with its parent burin inside the locus.
Legend for origin of blank (figures in cells) :
1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
5. Unrefitted and member of an unspecified flint type.
6. Unrefitted member of a flint type lacking debitage waste material.

	Locus						
Flint type	1	5	6	10	11	12	16
0	-	5	-	-	-	-	-
10	5	5*	5	1,5	5	-	5
11	-	2	-	-	-	-	-
12	-	-	-	6	-	-	-
20	5	5	5	5*	-	-	-
21	-	1,2	-	-	-	-	-
25	-	2	-	-	-	-	1
3	-	-	-	-	-	2	-

twisted fracture on the retouched part (Pl. 102: 9-12,28, Pl. 103: 7), and/or splintering (Pl. 102: 4,28), induced accidentally by rotation on a hard matter. Two final pieces had been used to engrave bone or antler.

At Rekem 5 East, 4 specimens have traces of use on bone or antler: graving in the case of a burin spall modified into a reamer (Pl. 82: 7), boring for 2 becs (Pl. 102: 1,5) and for another reamer (Pl. 102: 7). Five other pieces have macroscopic indications of use. Except for one drill fragment from a borer, located in the intermediate zone between the 2 concentrations of the locus, the items are grouped in the central area at Rekem 5 East. Three of these 9 tools were manufactured in 2 local flint types: 1 in flint type 5/11 (Pl. 102: 5), the 2 others in flint type 5/21 (Pl. 102: 1,9). In both cases, the flint types were primarily exploited for a serial production of scrapers used on fresh/wet hide (flint type 5/21; zone I of Map 132 & Map 133) or dry hide (flint type 5/11; zone II). A single bec (Pl. 102: 1) refits on an intentional fracture to its proximal fragment that had been used to cut fresh/wet hide before being transformed into a burin used for the same activity (Pl. 78: 100, see sections 6.3.6.1.1 & 6.3.7.5.1). This whole configuration further refits in co-set 05c14. The bec was found to the North, 4m away from the distribution zone of tools and debitage waste produced from this flint type. Used on bone/antler, it can be associated with 2 burins (Pl. 78: 2,18) and a truncation (Pl. 100: 11) made in the same flint type 5/21 and used on the same matter. All these pieces may reflect the occasional recuperation of flint artefacts during one or several sessions of bone/antler working, subsequent to the hide work in this sector of Rekem 5. The second drill fragment (Pl. 102: 9) in flint type 5/21, as well as the bec in flint type 5/11 (the latter equally used on bone or antler), might result from a similar recuperation.

Among the other elements from Rekem 5 (N=6), all manufactured in unspecified fine- or coarse-grained flint types, 1 single borer, made on a burin spall, refits with its (double) burin (Pl. 82: 7; set 05s098). It served to grave bone or antler, just like both the bevels of the burin which were possibly used for the same activity. The 5 final specimens (Pl. 102: 4,10-12), including a former projectile (Pl. 102: 7; section 5.6.2), could not be refitted but their raw material does not at all suggest that these pieces were imported.

At Rekem 6, 2 borers were used to pierce bone or antler (Pl. 102: 19,20) and are spatially associated with the burins from the main sector of this concentration[97]. They were manufactured in an unspecified fine- or coarse-grained flint type and could not be refitted.

Rekem 10 includes a double bec (Pl. 103: 8) that was used to grave bone/antler, a drill bit fragment of a bec (Pl. 102: 25) that had pierced an unspecified hard matter and 2 drill bit fragments from a borer (Pl. 102: 28) and a reamer (Pl. 103: 7) with only macroscopic rotation marks. All were found in the same quadrant at the southern sector of the combustion area, inside the dwelling. The double bec, in flint type 10/10, could be refitted onto an unmodified flake (set 10s60). The others, in coarse-grained flint 10/20, are not refitted yet seem also to be of a local production.

A fragment of a reamer drill used to pierce bone or antler (Pl. 103: 2) was found in the N sector of the main concentration at Rekem 12 and was associated with numerous burin spalls. It was manufactured in flint type 3, just like an unused double bec (Pl. 103: 3) from this concentration (see above). These pieces do not refit. In fact, type 3 flint is represented by only 4 blades and 1 flake at this locus.

The E axis of habitation zone 1 contains only 2 pieces which had been employed on hard matter. One, at Rekem 1, with a twisted fracture but no microwear traces, could not be plotted on the map because it lacks precise co-ordinates. The other element, a fragment of a reamer drill (Pl. 103: 1) used to pierce bone/antler, was found in the flint scatter at Rekem 11. It was manufactured in an unspecified flint type (11/10). This piece might be associated with 6 burins as well as with a composite tool also found in the scatter and that had all served to work bone or antler. Several of these latter pieces were clearly manufactured locally on debitage waste generated during the production of LMP blanks and were later recuperated. The question remains whether Rekem 11 combines 2 separate activities on a single spot or whether the bone/antler work was rather complementary, destined for the fabrication of hunting weapons (*e.g.* harpoons) of hard animal matter.

b) Hide work

2 pieces were used in dry hide work. One borer (Pl. 102: 14) served to pierce it. It was found quite isolated at the SW limit of Rekem 5 West, together with the single scraper at Rekem that had presented 4 IUZ of transverse contact on dry hide.

At Rekem 16, in the N part of the low-density artefact area SE of the debitage scatter, a bec (Pl. 103: 5), in flint type 16/10 (represented by a few artefacts only and thus presumably extra-local) had served to grave dry hide. It provides the only indication of dry hide work at this concentration[98].

c) Fire-lighters

3 pieces, one from the main sector of Rekem 6 (Pl. 102: 22) and both the others (Pl. 102: 24,26) found just S of the combustion area in the habitation at Rekem 10, presumably served as fire-lighter.

6.3.8.3 *Composite tools*

The few composite tools are distributed all over the various loci of habitation zone 1 (Map 152). They were mostly manufactured in non-specified flint types and they rarely refit (Tables 135 and 141). Only 2 pieces could be conjoined in a reduction sequence. These consist of 1 burin-truncation in flint type 1/

[97] One other element (Pl. 102: 15), is not mapped because its exact co-ordinates are lacking.

[98] The few used scraper-heads of Rekem 16 (N=2) served on fresh/wet hide (Pl. 98: 4,6; section 6.3.6.2.2).

Table 177
Origin of blanks of composite tools by flint type at the various loci of habitation zone 1.
Legend for origin of blank (figures in cells) :
1. Refitted in a local reduction sequence including debitage waste material.
2. Unrefitted, but debitage waste material of this specific flint type is refitting at the locus.
3. Unrefitted, but member of a specific flint type including non-refitting debitage waste material at the locus.
5. Unrefitted and member of an unspecified flint type.

	Locus							
Flint type	1	5	6	7	10	11	12	16
10	-	5	5	-	-	5	-	-
11	-	-	-	-	2	-	-	-
20	5	5	5	5	5	-	5	5
21	1	-	-	-	-	-	-	-
23	-	1	-	-	-	-	-	-
3	-	-	3	-	-	-	-	-

21 from Rekem 1 (Pl. 104: 1; co-set 01c01) and 1 burin-scraper in flint type 5/23 of Rekem 5 (Pl. 105: 1; co-set 05c05). They were produced locally, just like (presumably) the unique specimen in flint type 3 from Rekem 6 (burin-scraper; Pl. 104: 8) and the 2 specimens in flint type 10/11 from Rekem 10 (1 burin-borer, Pl. 105: 3 and 1 burin-scraper, Pl. 104: 10; Table 177). These pieces do not refit but they are lithologically very similar to the refitted (co-)sets and/or to the unrefitted debitage waste from their respective loci. The place of production of the other composite tools remains undetermined.

Half of these tools do not have use-wear traces (N=5)[99] or were too much affected by a mechanical alteration to allow for a functional diagnosis (N=4)[100]. The single mapped composite tool[101] from Rekem 1 comes from the debitage scatter, whereas the 2 specimens from Rekem 7 and Rekem 16 were both found outside their respective loci, in the SE periphery for the former and North of the main concentration for the latter.

The used specimens (9/18) are located in 5 loci (Table 178). They exclusively served on bone/antler at Rekem 5 (N=4; Pl. 104: 3-5, Pl. 105: 1) and Rekem 6 (N=2; Pl. 104: 6,7) where, like for borers/becs/reamers (see above), their spatial distribution corresponds with the bone/antler working areas of the burins. One piece was found in between these neighbouring loci. At Rekem 10 (N=1; Pl. 104: 10) and Rekem 12 (N=1; Pl. 105: 4) 2 burin-scrapers served to scrape dry hide. Both were found near a dry hide scraper in the S area of their concentration. Finally, one burin-scraper worked both materials at Rekem 11 (N=1, Pl. 104: 13). Its burin extremity, to which several spalls could be refitted (set 11s22), served to grave bone or antler whereas the opposed scraper-head was used to scrape dry hide. The tool was supposedly first used as a scraper, since the repeated burin resharpening ultimately reduced the length of the scraper blank to 18 mm, i.e. clearly below the general scraper discard limit (see section 5.4.3.4). For this use episode, the tool can be associated with the dry hide work area at Rekem 11, next to the work area for bone or antler from which it derives. It is possible that the tool was recycled in the course of the various activities that occurred in this sector.

Table 178
Rekem habitation zone 1. Traces of utilisation on composite tools at the various loci.

	Locus								
	1	5	6	7	10	11	12	16	Total
Total number	2	5	3	1	4	1	1	1	18
N suited for microwear determination	2	5	2	1	1	1	1	1	14
N with use wear traces	0	4	2	0	1	1	1	0	9
% with use wear traces	0%	80%	100%	0%	100%	100%	100%	0%	64%
Total number of I.U.Z	0	6	2	0	1	2	1	0	12
Action and contact matter of IUZ									
Scraping dry hide	-	-	-	-	1	1	1	-	3
Scraping bone or antler	-	1	1	-	-	-	-	-	2
Graving bone or antler	-	4	1	-	-	1	-	-	6
Boring bone or antler	-	1	-	-	-	-	-	-	1

[99] 2 burin-truncations of Rekem 1 (Pl. 104: 1), 2 burin-scrapers, at Rekem 5 (Pl. 104: 2) and Rekem 7 (Pl. 104: 9), and 1 scraper-truncation at Rekem 16 (Pl. 105: 7).
[100] 1 burin-scraper at Rekem 6 (Pl. 104: 8), and 2 burin-borers (Pl. 104: 11,14) and 1 burin-truncation (Pl. 104: 12) at Rekem 10.
[101] By lack of its precise co-ordinates, the other composite tool of Rekem 1 (Pl. 104: 1) could not be included in the detailed spatial analysis.

6.4 Discussion and conclusions

6.4.1 A residential *Federmesser* settlement

In a recent volume on *Federmesser* settlement patterns, Houtsma *et al.*[102] argue that all homogeneous, fully excavated NW European *Federmesser* sites should be interpreted as non-residential settlements (most probably hunting stands) presumably representing the inland, seasonal manifestation of a coastal-inland dyad. As this publication incorporates merely 10 small assemblages, all excavated more than 25 years ago, and occasionally even subdivided into different parts, in our opinion the conclusions primarily reflect irrelevant selection criteria. Sites with evidence of more extensive occupations were generally excluded because of incomplete excavation, partial distortion, insufficient publication or, apparently, because they were excavated during the last quarter of the 20th century (*e.g.* Niederbieber, Rueil-Malmaison, Rekem).

In any case, the elaborate analysis of the *Federmesser* record at Rekem, shows that this site at least partly functioned as a residential settlement, as defined by Binford[103]. The combination of the range of activities described in section 6.3 (the certain types of activities like fresh/wet hide working[104], the evidence of elaborate dwelling structures[105], the extensive maintenance of hearths and of occupation floors, the probable presence of children, the generation of dump areas, etc.) are all peculiarities which one would not expect in a short-term hunting stand or transit camp.

Once the remaining artefacts (unmodified blanks) have been examined for use-wear, it will be possible to estimate the minimal work hours needed for all the observed activities at Rekem (based on biographies of tools, IUZ-use times, knapping experiments, fire-related activities, etc.). While a preliminary enumeration of all these observations seems abounding, it is quite feasible that such a lavish inventory could be generated during a rather short occupation span and by a relatively small number of people. However, to gain a reliable assessment of the duration of the occupation reflected by the work conducted in a *Federmesser* settlement, other important questions remain:

1) do the different loci at Rekem *an sich* represent single occupation episodes?
2) do the various loci together represent the remains of one group of people living at the site during a continuous time-period, or was the site successively abandoned and reoccupied?

As there are no apparent distinctions within or between the loci as far as stratigraphical position or patination are concerned, contemporaneity at Rekem cannot be excluded *a priori*. However, demonstrating uninterrupted occupation is, of course, much more difficult. Since the landscape during the Alleröd was presumably more or less stable for around a millennium, the occasional passage of human groups along the Meuse valley corridor is very likely.

With regard to the first question, we would argue that in the case of the small knapping spots (Rekem 15, Rekem 16, Rekem 7, Rekem 11, and Rekem 13), the homogeneity of flint material and type of production, scarceness of use and the consistency of spatial distributions with expected patterns, all point towards single occupations or, at most, at repeated short-term visits by the same artisan(s). In the large domestic units like Rekem 10 (and perhaps Rekem 5 West), the homogeneity of the raw material, the knapping style and the tool types, as well as the remarkable preservation of the general spatial layout, also reveal a very consistent use of space, making important occupational intervals unlikely.

At the richest locus (Rekem 5 East), the locus most expected to represent a palimpsest generated by different occupations, the 'logic' of the sequence of activities, as outlined in section 6.3, and the high-definition spatial resolution, despite the subsequent scavenging of material for reuse at other loci, do not exclude occupation during one episode by a single group.

Finally, whether or not partly destroyed loci (Rekem 6 and Rekem 12), or the 'refuse disposal area' (Rekem 1) represent single-occupation episodes is less obvious. In the latter case, repeated 'visits' seem most likely, but these may have taken place in full association with continued occupation at the neighbouring habitations.

With regard to the second question – should habitation zone 1 be regarded as a single-occupation camp? – inter-locus refitting is often forwarded as an important tool in establishing the contemporaneity of spatially separated (activity) areas within archaeological sites. At the time of writing, a network of inter-unit relationships, connecting most of the concentrations within habitation zone 1 with refits of flint and/or other rock material, has been established (Map 25, Map 27). The transport directions of the various connections are summarised in fig. 116. In all, while most loci are connected, a succession of occupational episodes cannot be fully ruled out.

But can refitting really tell us something here? It has long since been argued that this method does not offer clear-cut and unambiguous solutions to the problem of the contemporaneity of occupation[106].

---

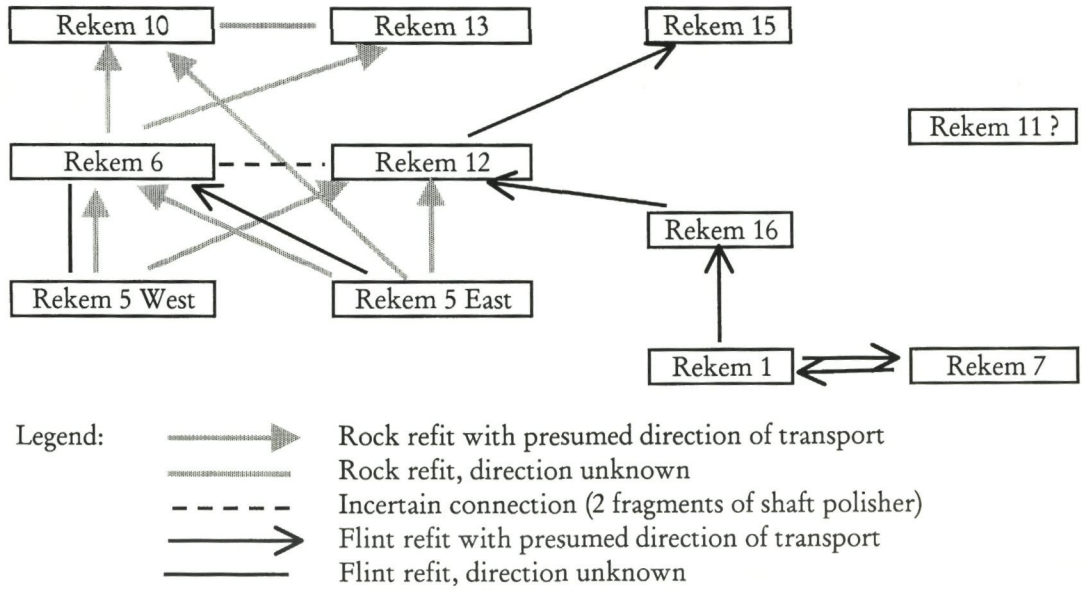
[102] Houtsma *et al.* 1996, 140-142.

[103] Residential settlements constitute '*the hub of subsistence activities, the locus out of which foraging parties originate and where most processing, manufacturing, and maintenance activities take place*' (Binford 1980, 9).

[104] '*Hide fleshing is a residential camp activity*' (Janes 1989, 135).

[105] '*The presence of dwellings is a distinguishing feature of base camps of longer duration, as compared to more ephemeral special-purpose sites*' (Janes 1983, 16).

[106] Bordes 1980.



116 *Synthesis of inter-locus refitting. Inference of direction for rocks: transport of big slabs to destination (small fragments ar left at source locus). Inference of direction for flint: transport of tools or blanks to destination (debitage waste is left at source locus).*

Temporally discrete sites can be connected, as earlier deposits can be used by later inhabitants to gather useful material (mining), or, conversely, for the dumping of waste material.

It should be noted, however, that in both cases, the abandoned locus becomes part of the activity space of the new settlement: it becomes respectively an extraction area or a dump area within the new context. In other words, if a network of inter-locus connections can be established, we can at least expect that the site will provide a representative image of the general use of space in a *Federmesser* settlement, even if fully continuous occupation cannot be proven. As extensively discussed in chapter 1 and maintained throughout our study, a site is always the material record of a sequence of activities. Since depositional processes always occupy a certain time span, any settlement is formed diachronically. While our precise objective was to reconstruct (part of) that dynamic, it is clear that it will always be difficult to estimate the precise time-span of possible *hiati* in this process.

In the case of interrupted occupation, several possible scenarios can be conceived:

- In the case of long-term *hiati*, it is likely that any organic material (remnants of dwellings, organic floors, site 'furniture', etc.) would have disappeared and that the detection of the abandoned site would therefore be difficult. Moreover, it can be questioned whether in this scenario, the Alleröd vegetation would not have also covered most lithic material. In this case, inter-locus refits become unlikely, though not impossible for larger (rock) remains (cf. connections from Rekem 5 and Rekem 6 to Rekem 10).
- In the case of shorter intervals (*e.g.* seasonal reoccupation), it is possible that a certain restoration of the camp took place and that the activity pattern was largely resumed. In such a scenario, habitation zone 1 can still be regarded as one settlement according to our definition in chapter 1 (section 1.3.3).

Finally, it should be emphasised that a lack of inter-locus refits certainly does not exclude simultaneous occupation as activities could be undertaken separately with no exchange of materials taking place. In fact, with respect to the flint material, such behaviour seems a hallmark of the *Federmesser* artisans.

In conclusion, there are good arguments to accept that the loci at habitation zone 1 were at least broadly contemporary and that this configuration is fully representative of a *Federmesser* settlement. Whether or not the edges of habitation zone 1 truly concur with the limits of the settlement is not yet assured. In fact, further extension to the North is quite likely. Future analyses will also have to establish the relation of habitation zone 1 with the other find-spots to the E (locus 2 and 3) and to the W (locus 9 and 14; fig. 13).

At most of the large-scale excavations of the last few decades, similar aggregations of *Federmesser* scatters have been found (*e.g.* at Meer, Weelde, Niederbieber, Andernach, Reuil-Malmaison, Saleux, Ambenay). Although refitting is not yet as well advanced at most of these sites, some inter-locus connections could equally be made at Niederbieber[107]. Further research will have to confirm whether such vast occupation zones reflect the true size of *Federmesser* camp areas in which case they most likely represent residential settlements[108].

On the other hand, it has been noted that "*the locations preferred for residential camps can be expected to yield a most complex mix of archaeological remains since they were commonly also utilised logistically when the residential camps were elsewhere*"[109]. One possible interpretation that might agree with such a scenario, would be to consider the small LMP production spots at Rekem 7, 11 and (partly) Rekem 1 to be iso-

[107] Bolus 1992.
[108] Contra Houtsma *et al.* 1996; see above.
[109] Binford 1982, 15.

lated, specialised camps. These camps might have been used for the manufacture of arrows, by one or a few hunters, in a zone that was formerly used as a residential camp area (Rekem 10, Rekem 5, Rekem 6). Such a model, however, would imply that the hunters who had left a settlement elsewhere had failed to carry a sufficient number of arrows. In the case of arrow repair, one would also expect the discard of broken points in these loci and this is not at all the case (at least not at Rekem 7 or Rekem 11).

In fact, disconnecting these loci from the residential areas seems unnecessary. They could readily be regarded as places fully belonging to a larger settlement, though reserved for the preparation of hunting gear, either during habitation (which would explain the two-way connection between Rekem 7 and Rekem 1) or while gearing up before moving to the next residential stage. As hunting was presumably one of the initial activities undertaken when arriving at a new residential camp (all subsequent processing activities such as butchering, hide fleshing, etc. depended on the success of the hunt) it is not unlikely that arrows were prepared in advance. This scenario would also explain the absence of LMP debitage refits in the habitation zones and the deviating character of many projectile tip flint types. In the course of further settlement, more arrows could then be prepared, and again be kept for further use at the next settlement stage.

6.4.2 Glimpses of social structure, gender patterns and ritual behaviour ?

"L'organisation de l'espace habité n'est pas seulement une commodité technique, c'est, au même titre que le langage, l'expression symbolique d'un comportement globalement humain. Dans toutes les groupes humains qui soient connus, l'habitat répond à une triple nécessité: celle de créer un milieu techniquement efficace, celle d'assurer un cadre au système social, celle de mettre de l'ordre, à partir d'un point, dans l'univers environnant"[110].

As so eloquently stated by one of the founders of the 'palaeo-ethnographic approach', the spatial configuration of a settlement is not only conditioned by the pattern of primary subsistence activities. Having arrived at a state of research where the sequence of these activities has been quite rigorously established, the question arises as to whether aspects of social structure or spiritual life can be perceived through the daily pattern of artefact manufacture, use, repair, and discard.

In spite of the fine-grained resolution attained by our analyses, the composition of the social group(s) associated with the archaeological record at Rekem, is still an open question. A presence of households, possibly nuclear families, is suggested by the dwellings and the presumed presence of children as perceived in the variety of knapping quality, and in particular, the instances of clumsy handicraft. Inside the dwelling at Rekem 10, the large number of projectile points might also hint at a presence of at least one adult male. However, it seems that other examples of tool type patterning are primarily linked with functional demands (*e.g.* hide working by several persons at Rekem 5) yet they fail to disclose any division of work according to gender[111].

One category of tools (projectile points), however, displays a special type of distribution within the camp area. There are good arguments for believing that the small isolated scatter of Rekem 7 should not be disconnected from the larger settlement (section 6.2.4.4). This raises the question as to why the manufacture of projectile points actually did occur in complete isolation. This contrasts with the production of other tool types which were generally made locally at the large communal areas (around hearths and inside dwellings, cf. Rekem 5 and Rekem 10). Conversely, whereas the discard of broken points was a common practice at the latter locations, indications of arrow point manufacture are extremely rare at Rekem 5 and almost absent inside the dwelling at Rekem 10 (section 6.3.4.2). While we may reasonably assume that projectile points were made by hunt-

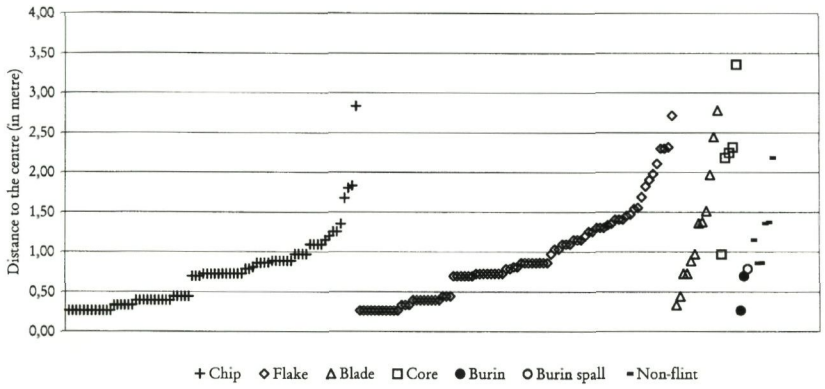
110 Leroi-Gourhan 1965.

111 Recent ethno-archaeological work in Ethiopia amongst people who still use stone scrapers for hide-working, recorded that in some groups it is done exclusively by men, in others exclusively by women, and in yet others by both men and women (Brandt 1996).

Table 179
Rekem 15. Indices of position and dispersal of various artefact types if recorded by quarter square metre. Legend: N = Number of artefacts; CNy = Mean North coördinate; CEx = Mean East coördinate; SDNy = Standard deviation of North coördinates; SDEx = Standard deviation of East coördinates; Radius = (SDNy + SDEx); Area = surface area in m^2 of circle with (SDNy + SDEx) as radius; AD = Average of absolute distances from artefacts to the midpoint (CNy,CEx) of their population.

Artefact type	N	CNy	CEx	SDNy	SDEx	Radius	Area	AD to C(Ny,Ex)
Chip	77	34.99	14.76	0.58	0.57	1.15	4.17	0.70
Flake	84	34.92	15.11	0.62	0.88	1.50	7.05	0.94
Blade	12	34.67	14.79	1.20	0.83	2.03	12.98	1.27
Core	5	34.65	16.25	1.32	1.41	2.73	23.47	1.90
Burin	2	34.50	14.75	0.25	0.00	0.25	0.20	0.25
Spall	1	35.25	14.25	0.00	0.00	0.00	0.00	0.00
Non-flint rock	6	34.58	14.92	1.11	0.75	1.85	10.76	1.30

117 *Rekem 15. Distance of various artefact categories to their common centre (N34.91 E14.96) if recorded by quarter square metre.*



ers, we can only speculate about possible gender patterns (men?), social rules (ages?), or ritual behaviour (taboos?) that may have accompanied the preparation of equipment that was eventually destined to kill. In most hunter-gatherer societies, the act of hunting is connected with a set of ritual prescriptions and symbolic meanings. This would provide an alternative explanation for more practical reasons like the problem of smelling, looking for tranquillity, safety[112], etc.

Obviously, grasping these dimensions with a study of the material culture alone remains an intricate endeavour, primarily based on personal reflections, and beyond the scope of the rigid data analysis conducted in the previous chapters.

6.4.3 Suggestions for future site recording

One of the goals of this work has been to explore the grain of resolution that can be attained with a detailed spatial analysis of lithic scatters on a Late Palaeolithic site in a sand context. The database in this case consisted (mainly) of individually plotted artefacts. Various authors have maintained that single artefact plotting can be conveniently substituted by the collective recording by quarter square metre, either for all artefacts[113] or for debitage only[114]. In fact, several techniques for spatial analysis have been designed to deal with such data[115]. In a recent article, Stapert and Johansen[116] also argue that cells of 50 x 50cm are still suitable for the application of 'Ring & Sector' analysis. It is unfortunate, however, that they do not, in their argument, compare the results of individual recording with grid-cell data based on the same sample.

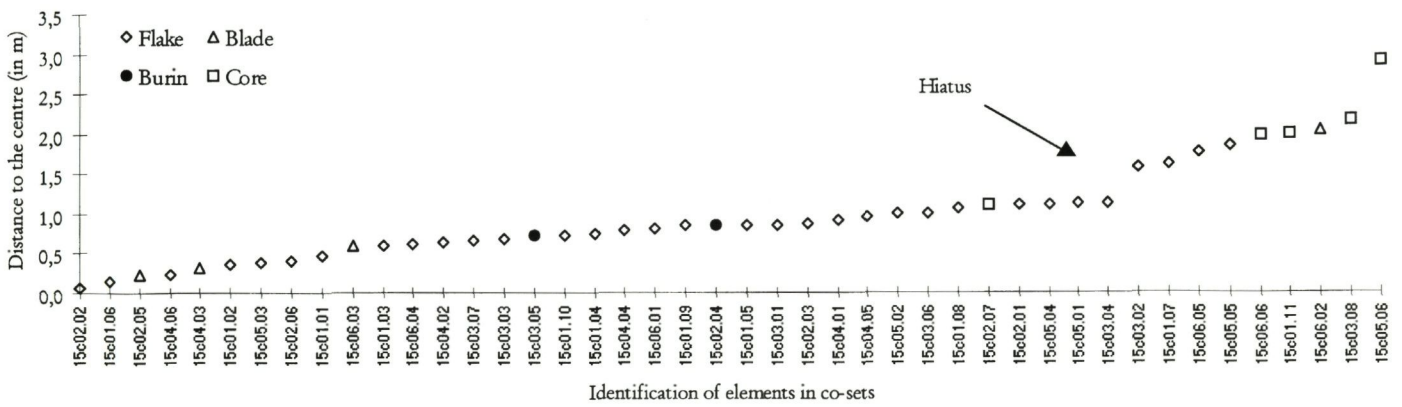
The results at Rekem do allow for an assessment in this regard. Would it be possible to reveal some of the fine-grained patterns (as *e.g.* observed at Rekem 7) with a grid-based data-set? As a general remark, it may be stipulated that relevant configurations in lithic artefact distributions often present a circular or ring-shaped layout (debitage scatters, hearth structures, dwellings, etc.), which seems to conflict with excavating in squares.

In order to explore the impact of the 'translation' of grid-cell recording on the outcome of spatial analyses in some detail, the results of *e.g.* Rekem 15 (see section 6.2.1.) can be used as a test-case. To test whether artefact recording in a grid system would have provided the information necessary for the recovery of the observed patterns, the co-ordinates of individual artefacts from this locus were set to the nearest midpoint of arbitrary grid cells each measuring 1/4 square metre (50 cm x 50cm). This procedure 'moves' the points over a maximum 35.5 cm. It also implies that adjacent artefacts may now be separated (or removed) by up to 70cm. The use of grid-cell midpoints was preferred to the randomisation of the artefacts within the grid cells, because in the latter procedure the maximum moves of individual artefacts could grow by twice these distances.

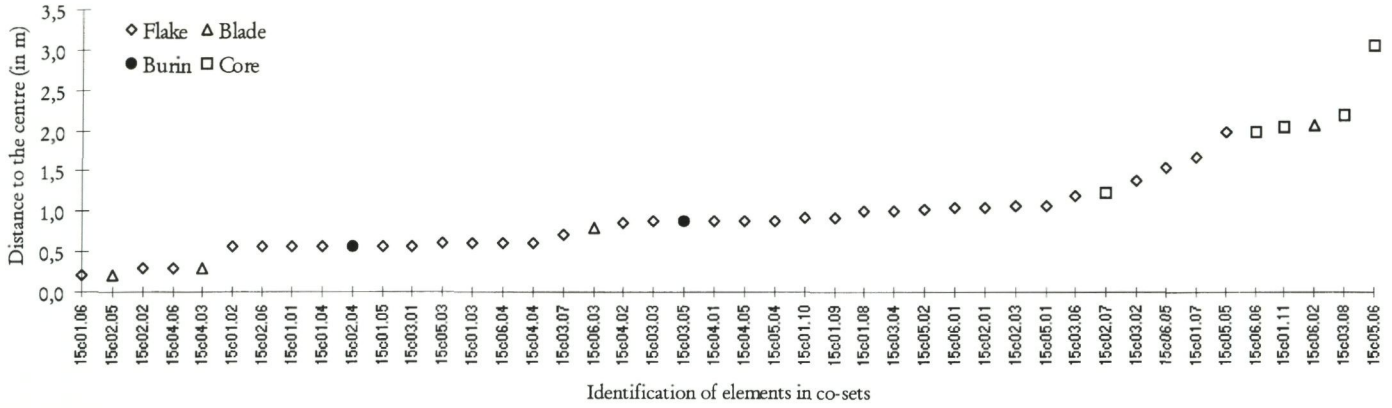
When the various spatial indices of the grid database are calculated (Table 179) and compared with the results of the individual recordings (Table 160), it is clear that the global results have not changed significantly. Both with regard to centroids of the

[112] Among the Efe Pygmies, '*men sometimes apply their poison to their arrow tips at the exterior fire associated with a hut, but for safety they commonly carry out this activity at a fire situated outside of the camp perimeter*' (Fisher & Strickland 1991, 222).
[113] Verhart 1995.
[114] Cziesla 1990.
[115] Blankholm 1990.
[116] Stapert & Johansen 1996.

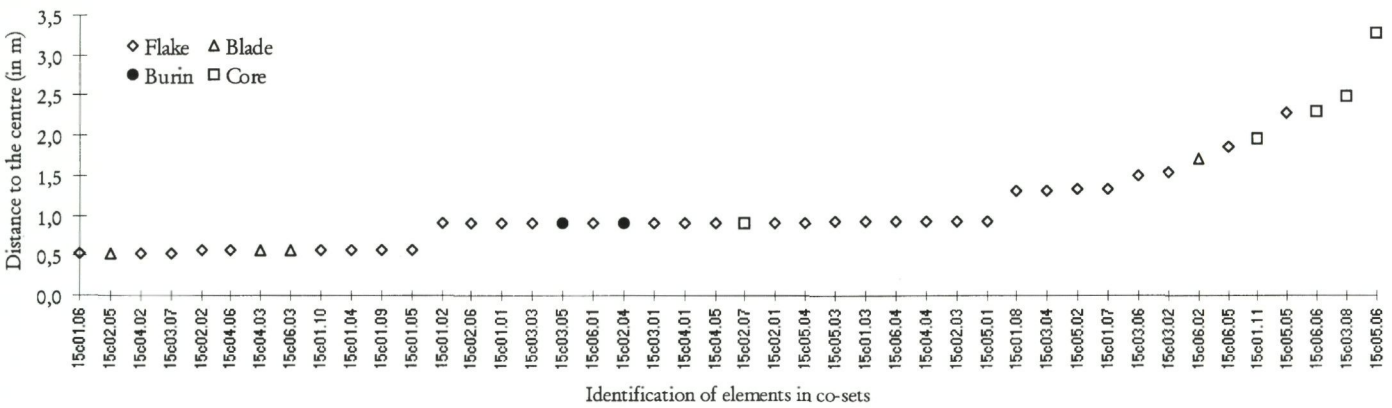
118 *Rekem 15. Distance of elements of refitted co-sets to their common centre (N34.95 E15.27). Absolute measures.*



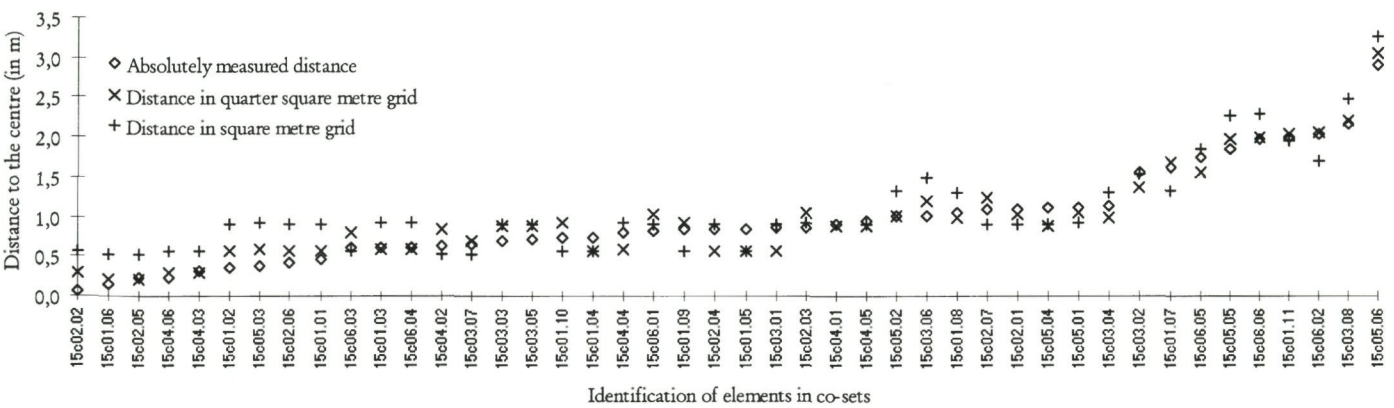
119 *Rekem 15. Distance of elements of refitted co-sets to their common centre (N34.93 E15.26). Quarter square metre simulation.*



120 *Rekem 15. Distance of elements of refitted co-sets to their common centre (N34.98 E15.27). Square metre simulation.*



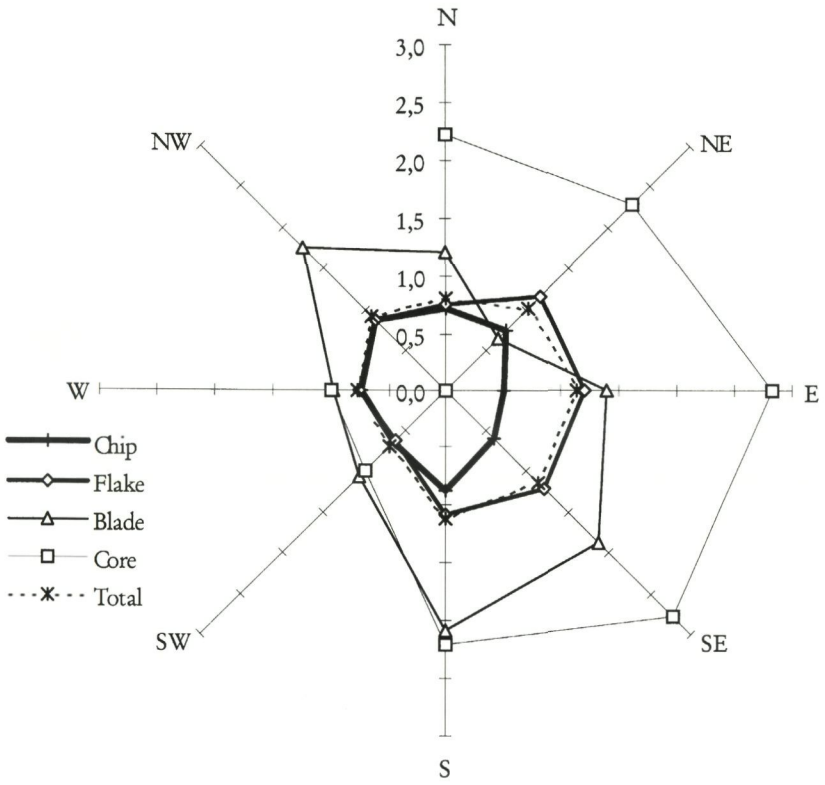
121 *Rekem 15. Distance of elements of core-including co-sets to their common centre. Comparison of exact distance with results of excavations in square metres or in quarter square metres.*



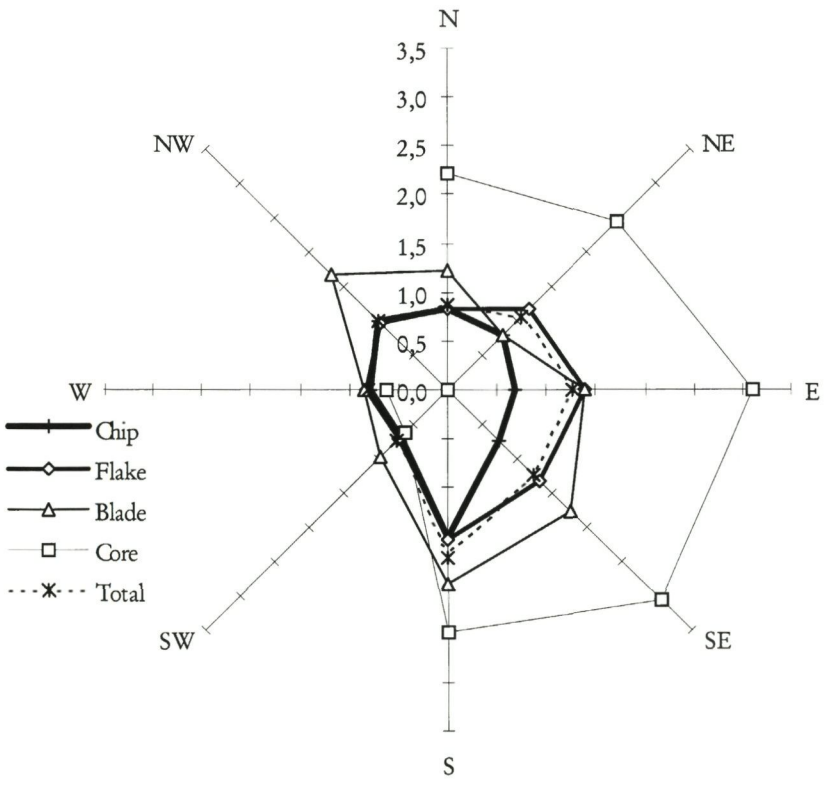
different artefact classes and with regard to the indices of radii and of average distances, shifts attain some centimetres at the most. In fact, these results could be expected, as individual moves tend to neutralise each other in such global indices.

Distance plotting of the individual artefacts from their common centre (fig. 117; compare with fig. 83) confirms that the general tendencies remain unchanged. Some minor differences however, can be observed in the details: the two burins, formerly at

122 *Rekem 15. Mean distance (in metre) of various artefact types to their common centre (N34.93 E14.97), in 8 sectors. Simulation for quarter square metre grid.*



123 *Rekem 15. Mean distance (in metre) of various artefact types to their common centre (N34.92 E14.96), in 8 sectors. Simulation for square metre grid.*



exactly the same distance, are now separated; conversely, the non-flint rocks seem to cluster in pairs in the grid-cell data. Furthermore, intervals are emerging within the formerly continuous trace-lines of chips and flakes. Such *hiati* are of course the artificial results of the grid-calculation, and must not be confused with empty zones, for instance between drop and toss areas.

Conversely, existing intervals, recorded by the analysis of individual piece-plotting, could disappear in grid-cell inventories. When all elements of refitted co-sets were plotted, for instance, a *hiatus* appeared between 1.13m and 1.56m from the centroid (fig. 118). Needless to say, such an empty band could have important spatial significance. In the quarter square metre simulation, this pattern completely disappears (fig. 119), while the full square metre simulation (fig. 120) again creates artificial *hiati*. Furthermore, it can be seen that the positions of individual artefacts have changed considerably. For instance, items that are situated in a 6th and in a 33rd position from the centroid in fig. 118, appear together on a single distance line in fig. 120. Opposite examples can also be found. Fig. 121 shows how individual artefacts actually moved as and when they were translated to grid cell data.

However, in spite of all these transformations, it has to be admitted that the major trends (*e.g.* outlying cores) are more or less preserved in the various presentations. This is clearly illustrated when one compares the final graphs of the grid-cell data (fig. 122 and fig. 123) with the original result shown on fig. 85. The general trends are well preserved in this kind of 'coarse representation', largely based on the calculations of averages. Still, some deformities do appear, modestly for the quarter square metre counts but clearly when dealing with full square metre grids: the anomalous distribution of the blades softens, while chips and flakes tend to become positively skewed towards the southern sector. Again, it is not unimaginable that such artificial creations would be interpreted as 'real' tendencies of *e.g.* preferential discard, directional erosion, etc.

In all, these observations suggest that there is some value in a fine-grained data-set. In addition to these observations, it may be noted that in the case of hearth structures, as observed *e.g.* at Rekem 5 or 13, information on the internal coherence of the broken slabs and on the precise layout of the rocks on a single square metre, is indispensable. If those features had been 'dissected' and collected in four adjacent square metres, it is unlikely that they would have been recognised at all. Needles to say, the recognition of hearths is most important for any subsequent spatial analysis.

In short, we would provisionally conclude that recording in quarter square metre grids can be an acceptable solution for excavations pressed for time and is, indeed, much better than recording in full square metre grids. This should not be regarded as a rule of thumb, however, and we would advise in

favour of individual recording on sites that are fairly likely to be *in situ*, or that may be valuable in the research of disturbance processes. The single argument for recording in grids seems to be one of time and money. In this respect, we would like to stipulate that for the Rekem project, recording during the fieldwork was certainly not the most expensive part, even though modern automatic 3D-recording techniques were not available at the time. However, the information recorded during these few months provided a data-set the potential of which has still not been exhausted after all those years and that can always be exploited anew for further research[117].

On the whole, we think that we cannot afford the luxury of ignoring all the extra information that fine-grained recording and detailed spatial analysis makes available. Just as we had no idea what the plotting of individual pieces could possibly lead to at the time of the Rekem excavations, we cannot pretend to foresee at present what may potentially be done with this information in the future. On the other hand, the tendency that 'micro-scale' site recording might lead to 'micro-scale excavations' should be avoided at all costs. We hope this contribution has equally shown that patterns in site structure are best identified in large-scale excavations which extensively explore the edges of the concentrations[118].

[117] Other possible testing with the Rekem data-set could for instance investigate to what degree the spatial resolution would have been preserved in case of progressive disturbance by agricultural activities, simply by comparing 'truncated' maps with the actual results.

[118] Some activities (*e.g.* hide working) precisely occurred in low density areas outside the main artefact scatters.

7 General conclusions

One of the major aims of this study was to investigate whether and to what degree a Late Palaeolithic 'sand site', clearly disturbed by post-depositional natural agents, can hold adequate information for detailed spatial analysis. Various attitudes can be adopted towards lithic scatters showing considerable vertical displacement. Firstly, one could simply ignore later disturbances and assume that the horizontal spatial distributions are still a reliable result of past human activities. Secondly, one could try to 'calculate' the impact of post-depositional processes and 'reconstruct' the site's original layout. Thirdly, an extremely sceptical attitude could be adopted leading to a fatalistic acceptance of the futility of spatial analyses in such contexts.

In this study, we have tried to adopt yet another approach. Of course, we fully recognise the importance of post-occupational natural processes and we advocate the systematic recording of any visible traces of these on the sites as well as all research concerning their effects. Yet, we are not yet convinced that their factual impact in many particular situations can be reliably 'computed' in such a way as to enable the reconstruction of the original end-of-occupation state of the site. This, however, should not lead us to despair. Since it may be assumed that various systemic activities did generate distinctive spatial patterning, we proposed to test the archaeological data on the presence of expected patterns of past human handling. For example, the working of hides demands space and is often performed outside a closed environment. Likewise, food preparation generally demands a fire as do certain types of hafting and retooling, and the very act of flint knapping creates specific layouts but the ultimate deposition of the artefacts depends on the context of the place, etc. However, before any such hypotheses can be tested against the 'robust dataset' registered during fieldwork, a thorough understanding and 'translation' of the archaeological record is required in order to recover the dynamics that can be interpreted as the result of human behaviour. Consequently, most of this work has been devoted to an elaborate study of non-spatial observations (composition, use, raw material, style of knapping and of tool manufacture, etc.) which eventually enabled us to formulate hypotheses regarding the expected spatial patterning.

Several methods and approaches that seemed useful to attain this goal – such as exhaustive microwear research, elaborate attribute analyses, extensive refitting, and detailed mapping of all the results (chapter 1) – were employed. In the course of the project, it appeared that the results of one approach were often supported by observations obtained with a different method. In all, the integrated research strategy proved to be extremely productive for a detailed examination of the archaeological record and its interpretation in behavioural terms, providing significant new insights into the functioning of a Late Palaeolithic settlement site.

The *Federmesser* settlement of Rekem provided a most adequate dataset for this type of research (chapter 2). Hardly affected by later occupation, and excellently excavated on a large scale but with a remarkable sense for detail by Robert Lauwers, the site consists of a cluster of concentrations, of which a central group, 'habitation zone 1' presents a particular layout. A range of artefact scatters appeared in this zone, with larger sites aligned along a W line, and smaller scatters occurring in the E. The site could be securely dated in the Alleröd Interstadial, which places it in a rather temperate context, with a subsistence economy potentially based on large mammals present on a year-round basis, albeit in low densities, and on fishing.

A first category of lithic material to be investigated included all the non-flint rocks. These were abundantly present at Rekem but were essentially confined to the large concentrations (chapter 3). These objects were mostly burned and many showed intentionally trimmed edges. Their exact function remains to be established, but they were presumably adequate for tasks in which size and mass were especially important, such as chopping, hacking, sawing, digging, and so on. Some clusters suggested localised activities. In addition to these 'heavy duty tools', other rocks served as hammerstones, shaft polishers and slabs for the grinding of haematite or for cutting. Quartzes, finally, were presumably used as cooking stones. In addition to their function as individual tools, rocks were also intensely employed as structural elements, in hearths or dwellings. In all, they turned out to be an extremely mobile class of objects, travelling both within and between different loci.

With regard to the flint material, this combined approach revealed aspects relating to the procurement of raw materials, knapping methods, tool manufacture, use, maintenance and, finally, discard. Some of the behavioural processes behind the formation of the lithic record could also be reconstructed. Two principal phases of flint manip-ulation were distinguished in our analysis: blank production (debitage; chapter 4) and blank consumption (tooling, use, and discard; chapter 5).

Regarding the production of blanks, a fine-grained picture of the *Federmesser* technology was offered. The numerous refitted co-sets in particular provided pertinent evidence.

The lithic industry at Rekem is characterised by a poorly elaborated blade technology, aiming at the production of short unstandardised blades and laminar flakes using direct hard hammer percussion. Flint knappers exploited a wide range of stones, in terms of quality, size, and morphology. Whatever the initial form of the stone, the artisans always tried to take advantage of its appearance in a most profitable way. The initial shaping and maintenance of the cores at Rekem was a very versatile process. It was largely guided by the shape of the original nodule or the changing state of the core and it essentially focused on the immediate production of (laminar) output, though on some occasions, a more regular core preparation occurred. The output of this flexible procedure was extremely versatile, both in terms of quality (unstandardised products), and in quantitative terms, ranging from half of the core volume being exploited, to a reduction index of 90 %. While a production of 100 blanks seems to have been a maximum output, reduction processes generated on average some 50 items.

Not taking into account the production of LMP, blanks selected for tooling and use were marked by great formal diversity, though with a certain preference for elongated elements. LMP were generally made on small blades (over 12 mm wide) rather than on bladelets. Tool types were manufactured in series, on blanks produced from single reduction sequences, generally rather skilfully knapped on good quality flint nodules. On the other hand, no particular reduction methods accompanied the various types of production, and blades of the most appropriate production sequences were mostly ignored for tool production. Some of these were used without modification.

In spite of the presence of knappers with divergent levels of technical skills at Rekem, the overall basic level of technical expertise, and the apparent lack of rigid procedural templates prevented a differentiation of individual artisans. Possible social aspects in terms of specialisation and correlated apprenticeship that may have guided flint knapping, therefore remained merely undistinguished. In all, however, flint knapping seemed a fairly elementary practice, of domestic rather than of prestige character, and virtually lacking more transcendent connotations. It was noted that the overall 'simplification' of the lithic technology, its versatile character, and inter-locus variability would probably not enhance the prospects of adequate inter-assemblage comparisons and regional studies.

The dynamic analysis of the various tool categories revealed new aspects of manufacture, repair, use and discard. The three major tool categories at Rekem are lateral modified laminar pieces (LMP), burins, and scrapers.

For the LMP, a major distinction could be detected between slender (less than 12 mm wide) and large elements. The elaborate macroscopic and microscopic analysis of functionally significant attributes, combined with an experimental shooting program, demonstrated that the former could be interpreted as projectile points or – occasionally – barbs, presumably inserted into reed shafts (for certain pieces at least). The latter were either knives or the result of tool-production mishaps. With regard to the missile propelling system, the use of low-weight bow and arrow was suggested. The refitting of tool waste (Krukowski microburins) and of shaping mishaps into reduction sequences provided insights into the production process, allowing the reconstruction of the original blanks and of the degree of backing. As opposed to the other tool types, LMP were not subjected to 'use-resharpening-reuse' cycles. Throughout their use-life, these tools conformed to particular design standards. Whenever the artisan failed to attain the required qualities, the project was abandoned. While the presumed existence of artisans' 'ideals' could make these tools 'stylistic guides' for regional (or chronological) facies within the *Federmesser* groups, the reconstruction of the 'preconceived forms' is heavily masked by the very incomplete state of the archaeological record. This mainly includes shaping mishaps in the production areas and broken, rejected fragments in locations where arrows were repaired.

With regard to the burins, a completely different type of tool-biography could be established. Most of the burins at Rekem were clearly expedient tools that were used, rejuvenated, and abandoned at the same spot where they were manufactured. This explains the high refitting rate for this tool class. The joining of burin spalls, retouch flakes, and fragments revealed that burins were very 'dynamic'. In the course of the 'use-resharpening-reuse' cycles, they could frequently be classified as different 'types'. Three major processes were employed for burin production and modification: spall removal, truncation, and breakage. Whereas breakage was the least common procedure, and essentially applied when thick parts of the blank had to be eliminated, modification by truncation was the most recurrent technique. Especially with regard to the atypical Lacan burins, it provided better shape control and permitted the artisan to preserve the required orthogonality between the various facets of the burin bevel. The removal of new spalls could always affect this condition and possibly also introduce other tooling accidents. Functional evidence confirmed that burins appeared to work

most efficiently when the three facets forming the trihedral corner of the burin edge were oriented perpendicular to each other. Burins primarily served with this part of the burin end, and with the burin facets, on bone or antler and occasionally also on hide. An interplay of functional aptitudes (type of action, burin facet orthogonality) and technical modalities (rejuvenation opportunities) contributed to their abandonment. As hand-held (unhafted) items, burins were *de facto* discarded when the reduction in length attained 3 cm. If multiple factors contributed to the ultimate 'layout' of the burins, it seems that the origin of the manifold 'types' resulted primarily from a combination of functional and technical eventualities that steadily affected the artefact's performances, rather than from the artisan's conscious aspiration to produce a preconceived form. It seems therefore that simple quantitative inter-assemblage comparisons based on Late Palaeolithic burin typology might fail to elucidate 'cultural' variability. On the other hand, the dynamic character of these tools opens promising perspectives for future comparative work.

In contrast to burins, scrapers are basically 'stable' tool types that mainly decrease in length, but otherwise represent more or less the same 'type' throughout their entire use life. At Rekem, no transformations could be documented from scrapers to other tool types or *vice versa*. On the other hand, the scrapers at Rekem were not very standardised. Although they were classified as various types of blade and flake scrapers, the overall impression is one of notable variety and boundlessness with regard to any imposed classification attempts. Functional evidence shows that the scrapers from Rekem almost exclusively served to scrape (mainly) dry hide with the scraperhead and were most likely hafted implements. Functional efficacy of these tools depended on the accuracy of the scraping edge cut (its scraping potential) and on the handiness of the support. In addition to a dimensional standard (minimum length of 22 mm), a range of tooling accidents, provoking irregularities in the scraping edge, led to the discard of these items.

Other tool classes at Rekem are less distinct. The group of truncated pieces is very heterogeneous and has potential links to all other tool types. There is little reason to assume that these were well-defined, intentionally designed tools intended for a specific set of activities. Refitting and microwear results showed that the highly variegated class of becs, borers, and reamers at Rekem is complementary with the burins. They primarily served in a rotary action on bone or antler. A similar association with burins could be established for the composite tools. Although use on dry hide could be sporadically attested, composite tools at Rekem primarily served for bone or antler work. In most cases, they could not be interpreted as the result of a purposeful combination of two different tooling end types on a single blank designed to create multi-functional devices. Rather, they were casual creations produced during recycling or as coincidental stages in the use lives of burins. In view of the scarceness of usewear traces, both randomly retouched tools and a wide range of edge-damaged artefacts can be interpreted as the inevitable by-products of flintworking.

The general characteristics of the production and consumption of flint material in the *Federmesser*-gruppen as opposed to the Magdalenian strategy are summarised in section 5.10. In overall terms, the *ad hoc* behaviour, characterising numerous facets of the *Federmesser* tradition, contrasts with the structured organisation generally observed in Magdalenian contexts.

Hypotheses based on the behavioural interpretations of the preceding analyses were examined on a spatial level and illustrated with maps and charts of relevant features (chapter 6). The results indicated that a detectable resolution of horizontal spatial patterning, ascribed to human activity, has been preserved at Rekem.

With regard to the place of production, a distinction could be observed between projectiles on the one hand and 'domestic' tools on the other. For the former group (Map 120), the presence of both local products (possibly made from recycled blanks) and extra-local pieces at the large retooling loci of Rekem 5 and 6, contrasts with the local production of LMP at Rekem 7 and 11. The production of scrapers (Map 129), burins (Map 135) and other tools (Map 152) is mostly local at the various sites. Only at the dwelling of Rekem 10 do more pieces seem to have been imported.

At the loci that were interpreted as small knapping spots (Rekem 15, Rekem 16, Rekem 13), or tool production places (Rekem 7 and Rekem 11), the spatial layout of the flintworking process perfectly corresponded with parallels from knapping experiments and ethno-archaeological contexts. These sites were identified on the basis of the assemblage composition, usewear, and refitting results.

At the larger habitation sites, the distribution of flint material equally corresponded with the expectations of artefact distribution around hearths and inside dwellings (Rekem 5 West and Rekem 10).

Finally, a surprisingly high level of spatial resolution could be perceived in the large and dense concentration of Rekem 5 East. Here, the open-air combustion area seems to have attracted a sequence of activities related to the procurement of game (maintenance of hunting gear), butchering and food processing activities, hide fleshing and dehairing, dry hide working, and various aspects of bone or antler work. Notwithstanding this amalgamation of refuse-producing activities in a single place, each performance appeared to have preserved specific intra-locus spatial patterning. The topographical location of used projectile points depended on their state of fragmentation. Short basal fragments were pressed out of the shaft adhesive and dropped near the hearth area, while longer specimens were pulled out and thrown to the periphery. With regard to scrapers, the location of the activity and the organisation of manu-

facture and resharpening, varied according to the physical state of the hides at the time of working. Fresh hide scraping and dry hide work occurred in separate areas at each side of the hearth. In the case of dry hide work, the production and resharpening of the scrapers was moreover spatially segregated from the scraping activity, presumably to avoid depositing retouch waste on the hide located outside the main concentration. The manufacture, use, maintenance, and discard of the burins, finally, essentially occurred at a single spot. If the blanks of earlier production sequences were present there, they occasionally were incorporated in the task at issue (esp. bone or antler work).

In all, it could be clearly established that the post-depositional processes at Rekem generally failed to blur the fine-grained spatial patterns connected with past human activities.

Together, the results depict the *Federmesser* settlement at Rekem as a relatively large camp area with, on the one hand, widely spaced settlement units representing residential areas where a sequence of processing and maintenance activities occurred and, on the other hand, some isolated knapping spots, either reserved for arrow(head) manufacture (and the fabrication of burins), or else lacking tool-production altogether. In short, the site was organised into more or less distinctive activity or disposal areas to such an extent that the ultimate contents of each site sector was very different. This intra-site variability is not restricted to tool type variety alone. Inter-locus differences in spatial patterning and functions were also observed on a technological level (different knapping styles) (*e.g.* tossing of cores at Rekem 15 *versus* dropping or placement of cores at Rekem 7 and Rekem 11). At Rekem, this variability may primarily be ascribed to the preferences and behaviour of individuals, rather than to more general 'cultural' differences.

Although we have attempted in this work to extend our interpretations beyond the limits of a conventional site report, it should be stressed that all our inferences were primarily extrapolated from the empirical analyses. A major emphasis of this study was on the detailed presentation of the data rather than on theoretical models. All primary observations are also compiled in extensive annexes and available on electronic data for any further processing.

Regarding future site recording, we keep advocating the detailed plotting of individual artefacts, even on sand sites. Since it has been shown that the horizontal displacement of artefacts was, after all, limited, it seems proper to recommend adjusting our field techniques to the type of site under investigation. In the case of small-scale hunter-gatherer camps it is to be expected that most activities were executed on a limited area at ground level. Only the detailed recording of the refuse produced during these activities can provide a convenient dataset for adequate interpretation. On the other hand, the spatial analysis has shown that patterns of behaviour and site structure are best identified in relatively large-scale exposures.

We hope that the results presented in this work demonstrate that a Palaeolithic living floor, left as a gigantic puzzle for the archaeologist, can generate meaning to a surprisingly high degree. For this to be reached, the continuous combination of diverse methods with the evaluation of numerous attributes requires a permanent flexibility in adjusting the approach no matter how much more work this would entail. Only then can one hope to accurately translate the static archaeological record into the dynamic context of the past system.

Whereas the effort invested in Rekem so far is presumably above average for a site analysis, further work could certainly still enhance our interpretations. Further methods of analysis might be the microwear analysis of non-refitted blanks, the identification of knapping techniques, the more detailed decoding of knapping skills, the more detailed analysis of the rocks, the examination of the samples for microchips, the analysis of the peripheral loci (especially Rekem 14) and their possible relation to habitation zone 1, the intensive exploration of the ethnoarchaeological literature, the experimental testing of the dwelling hypothesis at Rekem 10, and so on. On the other hand, the research strategy and the results can serve as a reference for future site investigations.

After so many years of intense research and truly remarkable results, we thus still have the feeling that more can be learned from these 'stones'. This very fact is perhaps the best support for the research strategy adopted. It is at the same time a warm commendation of the excavator, Robert Lauwers, who anticipated all this so rightly more than fifteen years ago.

Samenvatting

Rekem: een *Federmesser* kampplaats op de oever van de Maas

Deze publicatie presenteert het onderzoek van de grootste (opgegraven) site uit de oude steentijd in Vlaanderen: de *Federmesser*-vindplaats van Rekem. Deze openluchtnederzetting op de rand van de Maasvallei, werd in de jaren tachtig tijdens grootschalig noodonderzoek opgegraven onder leiding van R. Lauwers, in een samenwerking tussen enerzijds het *Laboratorium voor Prehistorie van de Katholieke Universiteit* te *Leuven* en anderzijds de voormalige *Nationale Dienst voor Opgravingen* – in de Vlaamse Gemeenschap opgevolgd door het *Instituut voor het Archeologisch Patrimonium*. Grootschalige ontgrindingen die het archeologisch rijke gebied op de vruchtbare rand van een oude Maasbedding bedreigden, vormden de aanleiding voor deze interventie.

In een eerste hoofdstuk van dit werk wordt de geschiedenis van deze operatie geschetst en wordt de ruimere context van het Laat-Paleolithicum (onderzoek) in de Benelux aan een kritische (terug-)blik onderworpen. Daarnaast is er in dit inleidend hoofdstuk aandacht voor de genese van Paleolithische 'leefvloeren' en voor de veranderende benaderingen van intra-site analyses in het steentijdonderzoek. Verder worden de onderzoeksmethodes en de doelstellingen van het Rekemproject gepresenteerd. Één van de voornaamste doelstellingen van dit onderzoek was te evalueren in hoeverre de verspreiding van stenen artefacten op een dergelijke vindplaats een weerspiegeling biedt van menselijk gedrag van zowat 13.000 jaar geleden. Kan een gedetailleerde ruimtelijke studie van steentijdmateriaal, gevonden in een zandige context, een licht werpen op de nederzettingsstructuur en het dagelijks leven van Laat-Paleolithische jagers-verzamelaars? Om deze vragen te beantwoorden werden diverse onderzoeksmethodes in dit project gecombineerd: attribuutanalyse (studie van talloze kwantitatieve en kwalitatieve aspecten van het assemblage), refitting (het opnieuw samenkleven van de artefacten), gebruikssporenonderzoek, en gedetailleerde cartografie in drie dimensies, dit alles begeleid door experimentele archeologie waar nodig. Deze vaak tijdrovende methodes, die op zichzelf al enige tijd als standaardprocedures worden beschouwd, werden hier zo grondig als mogelijk met elkaar geïntegreerd om de verschillende onderzoeksthema's uit te werken.

Hoofdstuk 2 stelt het terreinwerk voor en plaatst de site in zijn landschappelijke en chronologische setting. De tienduizenden vondsten, hoofdzakelijk resten van steenbewerking, werden nauwkeurig geregistreerd en ingezameld. Vermits in de zandgrond nagenoeg geen ander materiaal (zoals beenderen of hout) bewaard bleef, vormen zij de enige bron van informatie over deze kampplaats. Door de stratigrafische ligging van de artefacten, een kleine meter onder het huidige oppervlak, bleef de site wel grotendeels gespaard van moderne verstoringen. Anderzijds getuigde de verticale spreiding over 30-50 cm van een zekere post-depositionele verplaatsing door natuurlijke processen. In totaal werden in Rekem op een oppervlakte van 1,7 ha een 16-tal vindplaatsen (*loci* genaamd) geregistreerd. Centraal bevond zich een cluster met twee rijen concentraties, gelegen langs twee parallelle assen, één in het westen met een rij van grotere arealen, en één in het oosten met een serie kleinere concentraties. Zij vormen samen als 'woonzone I' de kern van de nederzettingsanalyse.

Door de vondst van harsresten die nog aan één van de spitsen kleefden kon de site via de C-14 methode gedateerd worden op 11.350 ± 150 BP (of 11.490-11.140 cal.BC), een ouderdom die in zekere mate werd bevestigd door thermoluminescentiedateringen van verbrande zandstenen (met een gemiddeld resultaat van 12.2 ± 1.1 ka). Deze kampplaats hoort bijgevolg thuis in de Alleröd, een warmere fase in de overgangsperiode van de laatste ijstijd naar de huidige tussenijstijd, met een halfopen landschap met verspreide berken en dennen. We mogen ervan uitgaan – vooral via parallellen met fauna-gegevens van *Federmesser*-sites uit de buurlanden – dat de economie gebaseerd was op de jacht op zoogdieren die leefden in kleine groepen, of individueel verspreid, maar die het ganse jaar door aanwezig waren (oerrund, edelhert, eland, ook bevers). In dit Maaslandschap is de kans groot dat er daarnaast wellicht ook visvangst plaatsvond.

Een eerste groep van lithisch materiaal, bestudeerd in hoofdstuk 3 omvatte alle niet-vuurstenen artefacten, voornamelijk zandstenen, kwartsieten en kwartsen. Deze waren vrij overvloedig aanwezig, zij het hoofdzakelijk in de grote concentraties. De grote

meerderheid hiervan was verbrand en velen toonden intentioneel bewerkte boorden. De precieze functie van deze elementen kon niet worden bepaald, maar zij waren wellicht geschikt voor diverse taken waarin vooral grootte en gewicht een rol speelden, zoals hakken, zagen, graven, enz. Daarnaast werden deze gesteenten ook gebruikt als kloppers of als *retouchoirs*, als pijlschachtgladders (vervaardigd in geimporteerde ijzerzandsteen), en als onderleggers om oker te vermalen, of om op te snijden. Kwartskeien werden ook als kookstenen gebruikt. Naast hun functie als werktuig, werden deze gesteenten verder ook intens aangewend als structurele elementen, in haarden of constructies, en waren het bijgevolg dankbare aanknopingspunten voor de ruimtelijke analyse. Refitting toonde aan dat het een erg mobiele groep artefacten betrof die vaak verhuisde binnen en tussen de verschillende concentraties.

Met betrekking tot het vuurstenen materiaal liet de combinatie van onderzoeksmethodes toe een grondig inzicht te verwerven in de strategieën van grondstofverwerving en kapmethodes, en in het aanmaken, gebruiken, onderhouden, en afdanken van de werktuigen. Structureel werden bij het onderzoek twee essentiële fases onderscheiden: de productie van supports (de debitage, hoofdstuk 4) en de consumptie van deze supports (in de vorm van werktuigen, hoofdstuk 5).

Voor de beschrijving van de vuursteen-reductietechnieken wordt in hoofdstuk 4 de analyse van het debitagemateriaal geconfronteerd met de inzichten verworven uit de talrijke refits. Van de grootste cosets worden de reductiesequentie, de productiviteit, de kwaliteit en de ruimtelijke spreiding individueel besproken. Daarnaast is er aandacht voor de vorm en de kwaliteit van de grondstof. Een inventaris van de verschillende silexsoorten is eveneens bijgevoegd.

Samengevat wordt de lithische industrie te Rekem gekenmerkt door een zwak ontwikkelde klingtechnologie gericht op de productie van korte, weinig gestandaardiseerde klingen en laminaire afslagen via directe percussie met een harde klopper. De steenkappers exploiteerden een groot scala aan vuursteenknollen, zowel op gebied van kwaliteit als van grootte en vorm. De voorbereiding en het behoud van de uitgangsvorm was een erg soepel proces, vooral geleid door de vorm van de oorspronkelijke knol en door het veranderend uitzicht van de kern. De opbrengst van deze soepele procedure was erg uiteenlopend, zowel kwalitatief als kwantitatief, variërend van een reductie tot de helft van de oorspronkelijke knol enerzijds, tot een reductie-index van 90 % anderzijds. Gemiddeld bracht dit een 50-tal elementen per kern op.

Voor het maken van werktuigen selecteerde men vrij uiteenlopende dragers, hoewel er een zekere voorkeur voor uitgelengde producten bestond. Alleen voor de elementen met afgestompte boord vond er een iets systematischer selectie plaats. Deze werden hoofdzakelijk gefabriceerd op kleine klingen eerder dan op echte microklingen. Via refitting kon ook aangetoond worden dat de werktuigtypes vaak in series werden aangemaakt.

Hoewel er duidelijke niveauverschillen bestonden in de know-how van de kaptechniek, werd het onderscheiden van individuele steenkappers bemoeilijkt door het algemeen beperkte niveau van technische finesse en het schijnbaar ontbreken van strikt voorgeschreven procedures. Mogelijke sociale codes verbonden met de aanwezigheid van eventuele kapspecialisten en bijhorende leerlingen konden daardoor niet worden onderscheiden. In het algemeen ging het hier om een vrij elementaire praktijk vooral bestemd voor directe utilitaire doeleinden, eerder dan om een prestigezaak. De progressieve vereenvoudiging van de vuursteentechnologie in de *Federmesser*-traditie, en het soepele karakter ervan, zal ook de mogelijkheden voor adequate vergelijkingen tussen assemblages op regionale schaal niet bevorderen.

De dynamische analyse van de verschillende werktuigcategorieën bracht in hoofdstuk 5 nieuwe aspecten van aanmaak, herstel, gebruik en afdanking van de werktuigen aan het licht. De 3 belangrijkste categorieën te Rekem zijn de elementen met afgestompte boord, de stekers, en de schrabbers.

Voor de eerste groep kon een essentieel onderscheid worden gemaakt tussen slanke stukken (minder dan 12 mm breed) en meer robuuste elementen. Op basis van een uitgebreide macroscopische en microscopische analyse van functioneel relevante attributen, gecombineerd met een programma van schietexperimenten, konden de slanke stukken geïnterpreteerd worden als spitsen van projectielen, soms ook als weerhaken, die minstens ten dele werden vastgezet in rieten schachten. Bij de bredere stukken bleek het vaak om mislukte eindproducten te gaan, in enkele gevallen ook om messen. Door het refitten van werktuigafval (zogenaamde Krukowski kerfresten) en gebroken stukken, en door mislukkingen terug te plaatsen in de reductiesequenties, verkregen we inzicht in het productie proces en konden de originele supports en de mate van laterale reductie worden gereconstrueerd. In tegenstelling tot de meeste andere werktuigcategorieën, werden deze types niet onderworpen aan cycli van 'gebruik-heraanscherping-herbruik'. Wanneer de maker niet in staat bleek om de gewenste vormgeving te bereiken, werd het project opgegeven. In de mate dat er een ideaalbeeld bestond voor deze werktuigtypes, gaat het hier theoretisch om uiterst geschikte stilistische markers, waarmee regionale of chronologische facies binnen de *Federmesser*groepen zouden moeten kunnen onderscheiden worden. Helaas wordt de reconstructie van deze ideaalbeelden erg bemoeilijkt door de onvolledige staat van het archeologisch archief, vooral bestaande uit mislukte elementen in de productiearealen, en uit afgedankte fragmenten op de plaatsen waar gebruikte stukken uit de schacht waren verwijderd.

Met betrekking tot de stekers kwam een heel ander type werktuigbiografie aan het licht. Het betrof hier uitermate doelmatige werktuigen die meestal

werden gebruikt, heraangescherpt en achtergelaten op de plaats waar ze ook waren aangemaakt. Daardoor konden zij ook makkelijk gerefit worden. Door stekerafval, retouche-afslagen en fragmenten opnieuw samen te kleven, werd het dynamisch karakter van deze categorie erg precies in beeld gebracht. In de loop van de heraanscherpingsprocessen konden zij achtereenvolgens als uiteenlopende types worden geklasseerd. Aanmaak en aanpassing van de stekers steunde op drie basistechnieken: transversaal breken, het verwijderen van stekerafval, en afknotten. Deze laatste techniek was het meest courant, wellicht omdat het een betere vormcontrole toeliet, waarbij vooral een rechte hoek tussen de verschillende facetten van het stekeruiteinde kon worden bewaard. Met het verwijderen van nieuw stekerafval liep men immers steeds het risico deze conditie te verstoren.

Stekers bleken inderdaad het meest efficiënt te functioneren wanneer de drie facetten van het stekeruiteinde loodrecht ten opzichte van elkaar georiënteerd waren. Volgens het gebruikssporenonderzoek werden ze in Rekem in de eerste plaats op been en gewei gebruikt, bij gelegenheid ook op huiden. Een samenspel van functionele eigenschappen en technische modaliteiten leidde uiteindelijk tot het afdanken van deze werktuigen, bijvoorbeeld wanneer de lengte tot 3 cm was gereduceerd, en ze niet langer bruikbaar waren zonder schachting. Talloze factoren bepaalden dus op bijna toevallige wijze de uiteindelijke vorm van deze werktuigen. Van een bewust nastreven van een vooraf geconcipieerd eindproduct kan in dit geval nauwelijks sprake zijn. Het lijkt daarom onwaarschijnlijk dat deze werktuigklasse geschikt zou zijn voor eenvoudige kwantitatieve typologische vergelijkingen tussen assemblages. Anderzijds opent het dynamisch karakter van deze werktuigen heel wat perspectieven voor toekomstig vergelijkend onderzoek tussen prehistorische culturen.

In tegenstelling tot de stekers, zijn schrabbers in essentie erg stabiele werktuigtypes die vooral in lengte gereduceerd worden, maar die een groot stuk van hun gebruiksleven tot een zelfde type blijven behoren. Transformaties van schrabbers naar andere categorieën, of omgekeerd, werden in Rekem niet vastgesteld. Toch ging het hier zeker niet om erg gestandaardiseerde werktuigen. Hoewel ze werden opgedeeld in verschillende types afslagschrabbers en klingschrabbers, gaat het in feite om één continue populatie. Schrabbers werden volgens het functioneel onderzoek bijna uitsluitend gebruikt voor het bewerken van huiden – hoofdzakelijk droge huid –, en werden meer dan waarschijnlijk ook gevat in een schacht. Hun efficiëntie hing in de eerste plaats af van het schrabpotentieel van het schrabhoofd, en van de hanteerbaarheid van de support. Naast een vereiste minimum lengte van 22 mm, werd het afdanken van deze werktuigen mee bepaald door een reeks van mislukte aanscherpingen die onregelmatigheden in het schrabhoofd veroorzaakten.

Andere werktuigklassen (afgeknotte stukken, boren en composietwerktuigen) te Rekem waren minder goed omschrijfbaar. De afgeknotte stukken zijn zeer heterogeen, met potentiële verbanden naar bijna alle andere werktuigtypes. Er is weinig reden om aan te nemen dat het hier om welomschreven, intentioneel ontworpen werktuigen ging, bestemd voor specifieke activiteiten. Refitting en gebruikssporenonderzoek toonden aan dat de sterk uiteenlopende klasse van becs, boren en ruimers te Rekem complementair is met de stekers. Zij werden vooral gebruikt om te boren in been en gewei. De schaarse composietwerktuigen vertoonden een gelijkaardige associatie met de stekers. Hoewel het gebruik op droge huid sporadisch werd vastgesteld, dienden ook zij in hoofdzaak voor been- en geweibewerking. Meestal ging het hier wellicht niet om een welbewuste combinatie van twee verschillende werktuiguiteindes op één enkele drager om multi-functionele instrumenten te bekomen, maar eerder om occasionele creaties, geproduceerd tijdens recyclage van vroegere supports, of zelfs om toevallige stadia in het gebruiksleven van de stekers. Gezien de beperktheid van de gebruikssporen, moeten willekeurig geretoucheerde werktuigen en een waaier van artefacten met beschadigde boorden tenslotte in de eerste plaats geïnterpreteerd worden als onvermijdelijke bijproducten van vuursteenbewerking.

Samengevat bracht dit vuursteenonderzoek een aantal aspecten aan het licht waarin de *Federmesser*technologie zich duidelijk onderscheidt van de voorloper van deze industrie, met name het Magdaleniaan. Essentieel treedt er een vereenvoudiging op, waarbij strikt voorgeschreven en uitgewerkte reductieschema's worden verlaten. Het systematisch gebruik van de harde hamer (stenen klopper) is daar niet vreemd aan. Uit de variabiliteit in de reductiesequenties en het beperkte transport van de werktuigen valt af te leiden dat de verschillende groepsleden zichzelf van silexmateriaal konden voorzien. Daarnaast werden ter plaatse ook oudere afslagen herbruikt. De soepelheid in debitage vindt een verlengstuk in de levensloop van de werktuigen, die erg varieert, en leidt tot weinig gestandaardiseerde afgedankte stukken.

Van de relevante eigenschappen bestudeerd in de voorgaande analyses werd in laatste instantie ook de ruimtelijke spreiding bestudeerd. In hoofdstuk 6 wordt aangetoond dat ruimtelijke patronen veroorzaakt door menselijk gedrag duidelijk bewaard bleven in het archeologisch archief.

Voor de gedetailleerde analyses kon een onderscheid worden gemaakt tussen twee types van concentraties in de centrale zone van de site: woon- en werkzones aan de westkant, en specifieke kapateliers, en mogelijk een afvalhoop aan de oostkant.

In de plaatsen die op basis van hun samenstelling, gebruikssporen en refitting geïnterpreteerd werden als kleine kapateliers (Rekem 15, Rekem 16 en Rekem 13) of productieplaatsen voor werktuigen (Rekem 7 en Rekem 11), kwam de verspreiding van het afval nauwkeurig overeen met patronen bekomen bij experimentele debitage of geobserveerd in etnoarcheologische context. Wanneer in de kapplaats van

Rekem 7 de spreiding van de afgedankte elementen met afgestompte boord werd uitgeplot per vuursteenknol, kon de positie van de steenkapper nauwkeurig worden bepaald.

In de grotere wooneenheden (Rekem 5 West en Rekem 10) correspondeerde de verspreiding van het lithisch materiaal eveneens met verwachtingsmodellen van vuursteenverspreiding rond haarden of in een woonstructuur. In de cirkelvormige hut of tent die in Rekem 10 op basis van de zandstenen, kwartsen, en kwartsieten kon worden gereconstrueerd, bleek het debitagemateriaal veel ruimer verspreid, klaarblijkelijk onder invloed van langdurige occupatie. Toch konden ook hier nog specifieke activiteitspatronen onderscheiden worden, bijvoorbeeld in relatie tot het schachten van de pijlspitsen, waarbij oude gebruikte spitsen uit de schachten waren verwijderd. Bij dit proces kwamen de kleine basisfragmentjes die uit de schacht werden losgepeuterd in de haard terecht, terwijl de grotere stukken werden weggeworpen naar de randen van de concentratie.

Tenslotte werd een verrassend niveau van ruimtelijk resolutie gepercipieerd in de grote dichte concentratie van Rekem 5, waar de vuurplaats in open lucht klaarblijkelijk een hele reeks activiteiten had aangetrokken in verband met de jacht (onderhouden van pijlen), slachten en voedselbereiding, villen, huidbewerking en verschillende aspecten van been- en geweibewerking. Niettegenstaande dit amalgaam van afvalproducerende activiteiten binnen één enkel areaal, en het uitermate complexe refitnetwerk dat daaruit resulteerde, bleek elke uitvoering daarbij een specifiek patroon van locale ruimtelijke spreiding te hebben bewaard.

Bij het uitplotten van de verschillende silextypes, bijvoorbeeld diegene die in relatie staan met de schrabbers, bleek deze cluster uit 2 grote zones te zijn opgebouwd, een configuratie die eveneens weerspiegeld is in de spreiding van de schrabbers zelf. Merkwaardig was dat ook de onafhankelijk gedetermineerde gebruikssporen op de schrabhoofden een gelijkaardige ruimtelijke verdeling volgden. Bij het prepareren van de huiden werd de locatiekeuze voor het aanmaken en aanscherpen van de schrabbers enerzijds, en het afdanken anderzijds, blijkbaar bepaald door de staat van de huid en de manier waarop zij werd bewerkt. In verse toestand geschiedde de schrabactiviteit wellicht in een verticaal kader, aan één zijde van de haard, terwijl het verder verwerken van de droge huid op grondniveau plaatsvond aan de andere zijde. Tijdens deze laatste fase werden de schrabbers op een andere plaats aangescherpt, klaarblijkelijk om te vermijden dat retoucheafval op de huid terecht zou komen.

Voor de verwerking van been en gewei met de stekers, veranderden de ambachtslui niet van plaats. Het productie- en aanscherpingafval van deze werktuigcategorie werd steeds bij elkaar op een zeer kleine oppervlakte teruggevonden. Als zich daar ook elementen van vroegere productiesequenties bevonden raakten die bij gelegenheid betrokken in de taak die op dat moment werd uitgevoerd.

Samengevat kon duidelijk worden aangetoond dat de post-depositionele processen te Rekem in het algemeen niet hebben geleid tot een volledige vervaging van de gedetailleerde patronen gerelateerd aan vroegere menselijke activiteiten.

Dankzij de lange-afstand-refits van zowel silex als niet-vuurstenen artefacten, kon ook de onderlinge afhankelijkheid van de diverse sectoren worden aangetoond en de interne relatieve chronologie van de nederzetting uitgewerkt. De *Federmesser*nederzetting te Rekem komt daaruit naar voor als een vrij uitgebreide kampplaats met aan de ene kant behoorlijk uitgestrekte residentiële sectoren waar een opeenvolging van verwerking- en onderhoudsactiviteiten plaatsvond, en aan de ander kant enkele geïsoleerde kapplaatsen, die vaak werden voorbehouden voor het vervaardigen van pijlbewapening. Hoewel de ruimtelijke organisatie grotendeels vanuit functionele overwegingen kan worden verklaard, kunnen bij de structurering ook sociale factoren als ouderdom, status of geslacht van de bewoners hebben meegespeeld, net als rituele gebruiken en taboes.

Samenvattend heeft dit onderzoek aangetoond dat de jager-verzamelaargroepen die 13.000 jaar geleden deze regio bevolkten wellicht grotere en duidelijker georganiseerde residentiële nederzettingen aanlegden dan tot hiertoe werd aangenomen. Op methodologisch vlak bewezen de resultaten van dit onderzoek dat een paleolithische leefvloer, die zich aan de archeoloog presenteert als een gigantische puzzel, zelfs bij gebrek aan organisch materiaal in verrassend grote mate kan worden ontcijferd met een aangepaste geïntegreerde benadering. Om dit te bereiken vraagt de voortdurende combinatie van diverse onderzoeksmethodes en de evaluatie van talrijke attributen een permanente flexibiliteit. Enkel dan mag worden verhoopt dat de statische archaeologica accuraat kunnen worden vertaald naar de dynamische context van het prehistorisch verleden.

Résumé

Rekem: un campement *Federmesser* sur la rive de la Meuse

Le site de Rekem (Limbourg belge) est localisé sur une dune tardiglaciaire, à quelques 800 mètres du lit actuel de la vallée de la Meuse. Les fouilles, effectuées de 1984 à 1986 par le *Laboratorium voor Prehistorie* (K.U.Leuven) et l'ex Service national des Fouilles (actuellement *Instituut voor het Archeologisch Patrimonium* de la Communauté flamande de Belgique) sur une superficie totale de 1,7 hectares, ont permis d' individualiser seize concentrations composées essentiellement de matériaux lithiques (silex, grès, quartzite, ocre, ...). L'acidité du sol, très élevée, n'a pratiquement pas permis la conservation des matériaux organiques.

Les différentes concentrations mises au jour sont d'inégale importance en regard de leur taille et de la richesse de leur contenu. Elles comprennent des zones domestiques de 50 m^2 à 60 m^2 autour d'aires de foyer (Rekem 5, 6, 10 et 12), parfois localisées dans une structure d'habitat, ainsi que quelques postes spécialisés de débitage et de façonnage d'outils (Rekem 7, 11, 13, 15 et 16) et une aire de rejet (Rekem 1), de superficie réduite, correspondant à quelques mètres carrés. Ces concentrations s'alignent selon deux axes pratiquement parallèles, orientés nord-ouest/sud-est et distants entre eux de 15 à 20 m, et constituent la zone d'habitat n° 1. L'axe occidental est composé de zones domestiques, l'axe oriental, d'aires spécialisées de débitage et de rejets. On trouve également des zones plus diffuses d'artefacts en faible quantité dans les aires de circulation entre ces diverses concentrations (Rekem 4 et 8) ou attenantes à certaines d'entre elles (Rekem 11 et 16). Le campement, daté de 11.350 ± 150 BP (OxA-942), se situe dans l'Alleröd.

En combinant les analyses morphométrique, technologique, fonctionnelle et spatiale, cette recherche avait pour objectif d'interpréter le comportement des chasseurs-cueilleurs dans leur contexte systémique et dynamique, en se basant sur des observations effectuées directement sur le matériel archéologique.

L'analyse dynamique des remontages confirme la simplicité et la flexibilité des méthodes de taille du silex. L'industrie lithique est caractérisée par une technologie laminaire peu développée, orientée vers la production de lames courtes peu standardisées et d'éclats laminaires, obtenus en percussion directe au percuteur dur. Les tailleurs ont exploité un large éventail de rognons aux qualités clastiques, aux formes et aux dimensions très diversifiées. La préparation et le traitement des volumes originaux se fondent sur un procédé souple, guidé avant tout par la morphologie et par les modifications successives du nucleus. Le rendement est assez variable, d'un point de vue qualitatif et quantitatif: limité à un demi-volume de rognon jusqu'à un degré de réduction équivalent à 90 %. En moyenne, la production correspond à une cinquantaine d'éléments par nucléus. La simplification progressive de la technologie du silex au sein de la tradition des groupes à *Federmesser* par rapport au Magdalénien limite la reconnaissance éventuelle de tailleurs individuels et les comparaisons entre ensembles régionaux.

L'étude de l'outillage du site fait ressortir une distinction nette sur le plan technologique, fonctionnel et spatial entre les trois catégories d'outils les plus représentatives du gisement: les pièces laminaires ou lamellaires à modification latérale (essentiellement des armatures de trait), les burins (utilisés principalement sur des matériaux osseux) et les grattoirs (surtout associés au travail des peaux). La variabilité observée dans chacune de ces catégories peut être expliquée par les différentes manipulations à l'intérieur d'un campement (fabrication, utilisation, entretien et abandon). La caractérisation des témoins abandonnés aux différents étapes de leur biographie conduit à une réévaluation de leur valeur stylistique (et donc culturelle) et doit nous mettre en garde contre l'utilisation abusive des catégories typologiques comme paramètres diagnostiques d'éventuels faciès régionaux dans les groupes à *Federmesser*. D'autre part, les observations sur la dynamique des outils méritent d'être prises en compte dans de futures études comparatives.

Les traits les plus pertinents mis en évidence dans les analyses précédentes ont été confrontés dans le cadre d'une analyse spatiale. Les résultats font apparaître qu'en dépit de déplacements verticaux importants subis par les artefacts, leur distribution horizontale reflète encore leur configuration spatiale originelle, permettant ainsi une reconstruction élaborée de toute une séquence d'activités dans un campement des groupes à *Federmesser*. Les postes de débitage ou de fabrication d'outils composant l'axe

oriental de la zone d'habitat n° 1, comportent une distribution des déchets de taille, caractéristique pour ce type de dépôt. Dans les grandes concentrations occidentales, la distribution du matériel lithique correspondait également aux modèles attendus autour de zones de foyer extérieures ou internes à une structure d'habitat. On a pu y mettre en évidence l'existence de quelques aires d'activités spécifiques. Ainsi, le grand foyer central ouvert de Rekem 5 a eu un effet de « pôle d'attraction » pour toute une gamme d'activités liées à la chasse (démanchement d'armatures de trait), à la décarnisation du gibier et à sa consommation, au traitement des peaux à l'état frais ou humide et sec en deux secteurs distincts, ainsi qu'au travail des matières osseuses (os/bois de cervidé). Ce palimpseste d'activités, générant un amalgame de déchets à l'interieur d'une même aire, permet néanmoins de reconnaître, pour chacune des activités identifiées, une distribution spatiale spécifique.

Les remontages sur de longues distances d'artefacts en silex ou en d'autres matériaux démontrent l'interdépendence des deux secteurs de la zone d'habitat n° 1, ainsi que la chronologie relative interne du site. Les chasseurs-ceuilleurs, qui occupaient cette région il y a 13.000 ans, vivaient dans des campements résidentiels assez vastes et clairement organisés. D'un point de vue méthodologique, les résultats obtenus à Rekem montrent que l'usage combiné et parfaitement intégré de diverses méthodes d'analyse d'un site, dont les conditions de préservation sont réduites, ouvre des perspectives inattendues quant au décodage et à l'interprétation d'un sol d'habitat paléolithique, en replaçant les documents archéologiques statiques dans leur contexte préhistorique dynamique.

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Annex 3. Database of refitted flint artefacts.

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By combining various research methods, the authors of this two-volume book present a reconstruction of prehistoric life in one of the largest Palaeolithic camp sites excavated in NW Europe: the Federmesser camp at Rekem (near Maastricht), situated on a sand ridge on the left bank of the river Meuse. Following careful excavation and the individual mapping of some 25,000 stone artefacts across an area of 1.7 ha, the 13,000-year-old assemblage has been subjected to a range of laboratory analyses. Refitting of several thousand artefacts (tools, tool waste, and debitage) in their original sequence of knapping, shed light on lithic manufacturing, tooling, and maintenance processes. Use-wear analysis of 2,500 pieces has unveiled a series of activities performed at and away from the camp area: hunting and arrow manufacture, butchery, hide fleshing and currying, bone and antler work, etc. These results were systematically tested with appropriate experiments. Lastly, extensive spatial analyses of all the above observations allowed for a neat reconstruction of the chain of activities performed in this hunter-gatherer settlement, where the locations of the work areas, in the dwellings, near communal hearths or at specific work shops, also hint at fascinating aspects of social and spiritual life in a Lateglacial environment.

Cover illustration: manufacturing of arrow armatures at Rekem 7.
Drawing by Benoit Clarys.

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